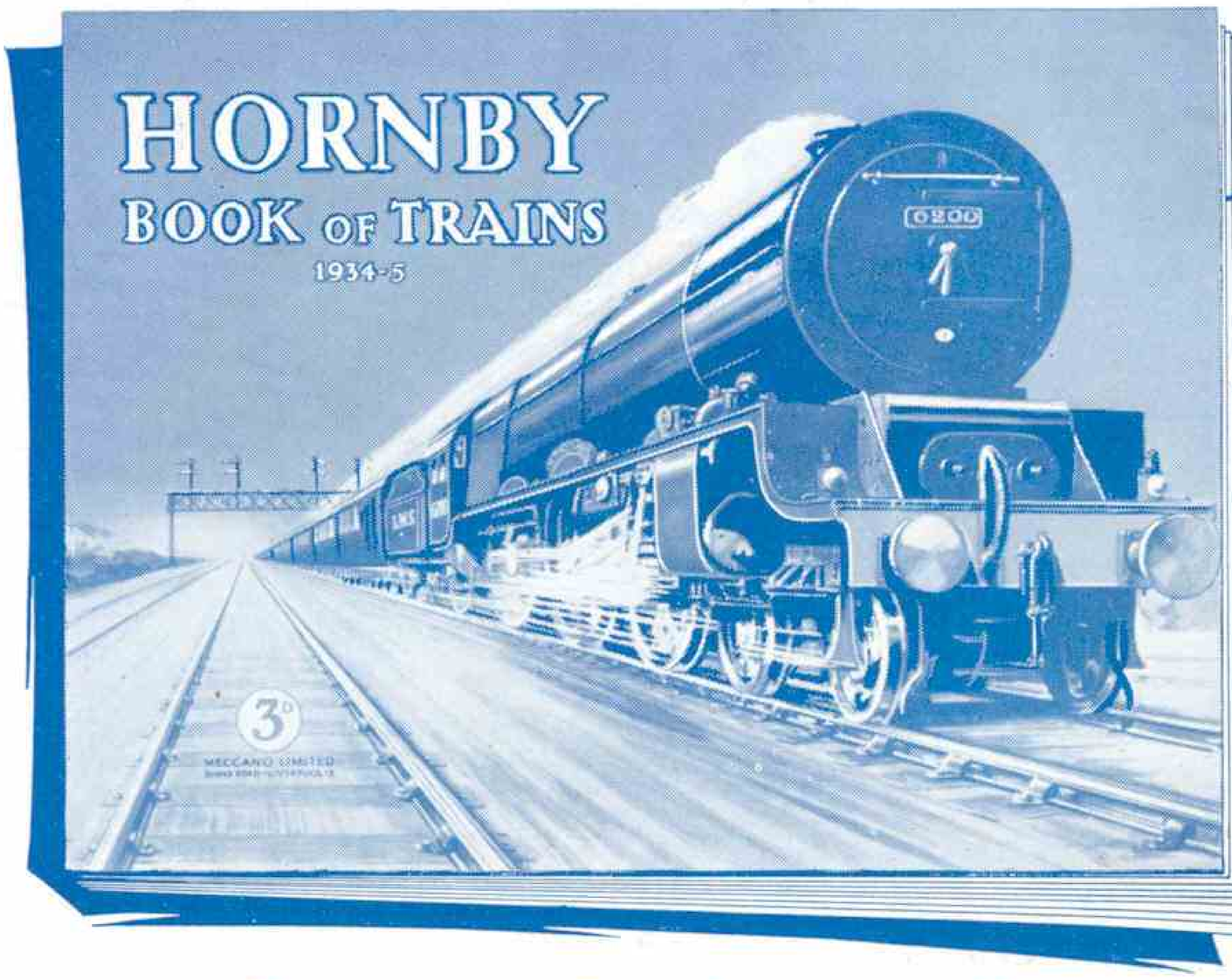
VOL. XIX. No. 12 DECEMBER 1934

MECCANO MAGAZINE

WORLD'S LARGEST LIFT LOCK
(see page 946)

6D.



- A Book of absorbing interest to boys
- Increased in size this year to 64 pages
- Printed on finest quality art paper obtainable
- Beautiful cover, printed in full colour
- The best edition we have ever produced

Bigger! Brighter!! Better!!!

This splendid new edition of the famous Hornby Book of Trains is the best yet. It is bigger, brighter and more interesting than ever. Fascinating articles on railway activities are included, and it is illustrated with superb photographic reproductions. It tells the story of the development of modern luxurious expresses, and describes the most famous British tunnels. Other articles deal with three-cylinder locomotives, and with the fascinating subject of locomotive names. Every page is full of interest and provides a wealth of information for the railway enthusiast.

In addition, the complete range of Hornby Trains, both Electric and Clockwork, together with all Hornby Rolling Stock and Accessories, are described and beautifully illustrated in full colour.

HOW TO OBTAIN THE BOOK

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

Direct orders are not acknowledged. They are dealt with as soon as they are received, and every endeavour is made to send the book to the purchaser by return of post.

ORDERS FROM AUSTRALIA, NEW ZEALAND, SOUTH AFRICA AND CANADA

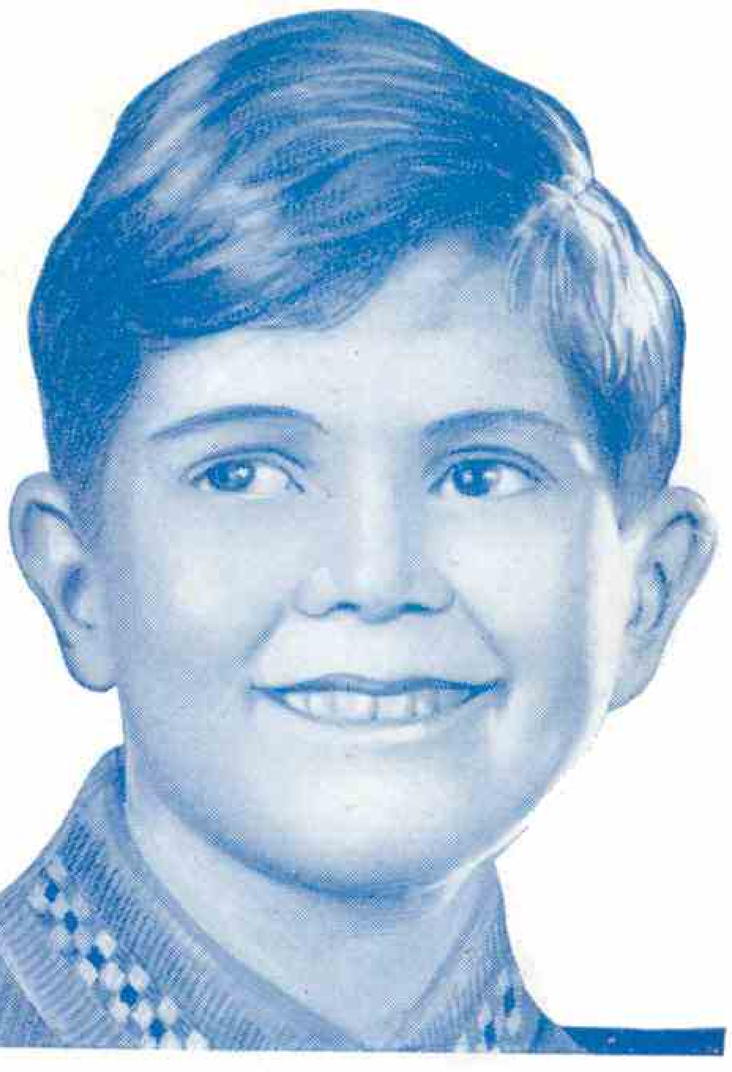
Supplies of the Hornby Book of Trains have already been despatched to our agents in Australia, New Zealand, South Africa and Canada to fill orders received. The Australian price is 1/– post free, the South African 9d. post free, the New Zealand 6d. post free, and the Canadian 12 cents post paid. Readers living in Australia, New Zealand, South Africa or Canada who require copies should send their orders to the addresses given below.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending a remittance of 6d. with their order.

OVERSEAS AGENCIES:

AUSTRALIA: E. G. Page & Co., 52, Clarence St., Sydney (P.O. Box 1832k).
NEW ZEALAND: Models Limited, P.O. Box 129, Auckland C1.
SOUTH AFRICA: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).
CANADA: Meccano Ltd., 34, St. Patrick Street, Toronto.

Get your copy of the 1934-5 edition TO-DAY!



OBTAINABLE HORNBY BOOK OF TRAINS

3d

Published by
Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13

NEXT MONTH: "ON THE FOOTPLATE OF A 'NIGHT GOODS'." READY: 1st JANUARY

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XIX. No. 12
December, 1934

With the Editor

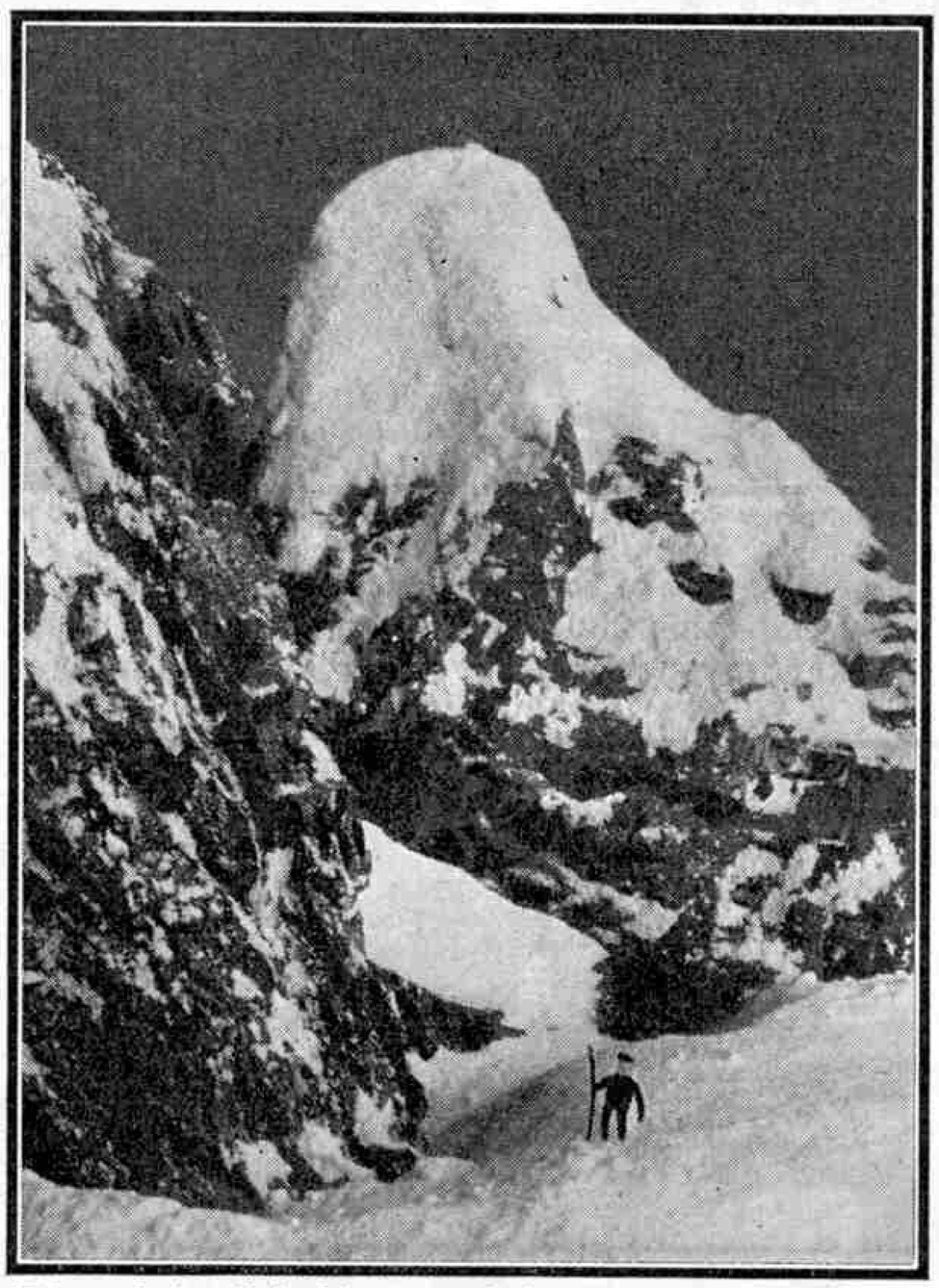
Christmas Greetings

Again the time has come round for me to wish all my readers "A Merry Christmas." These greetings will reach most of them well in advance of the Christmas season itself, but I do not think they will be too soon, for Christmas is already in the minds of practically every boy and girl, and the brilliantly-lighted windows of shops and large stores are a continual reminder of its approach. The festive season is to-day more popular than ever, and is celebrated with equal delight by young and old, whether in the northern hemisphere where the traditional Christmas snow and frost may be expected, or on the other side of the world where it is enjoyed in the middle of the southern summer. Wherever they are, and whatever their surroundings, my thoughts on Christmas morning will be with every reader of the Magazine.

Toys at the Beginning of the Century

My reference to the brilliantly-lighted windows of stores and shops at Christmas time has reminded me of the wonderful changes that have taken place in regard to Christmas toys since the beginning of the present century. Powerful electric lights and neon signs make the shops in which these are sold much brighter than they were 34 years ago, but there has been even greater improvement in the toys themselves. In those days the only locomotives available, other than expensive scale models, were either big wooden affairs that bore little resemblance to any engine ever seen on any real railway, or crudely-constructed clockwork affairs that often found their way to the junk heap in a few weeks owing to the failure of their mechanisms. The range of other toys also was extremely limited, and boys thought themselves fortunate to possess toy swords, tin trumpets, pop-guns, Noah's Arks, and similar articles, the use of which called for a vigorous display of fancy and imagination.

What a contrast the shop windows of to-day show! Meccano Outfits have played a great part in brightening them, and every boy revels in the opportunities these give him of building working models that are real engineering. Hornby Trains bring realism into miniature railway working for thousands of enthusiasts and electricity, chemistry and other branches of knowledge also contribute their share to the wonderful array of working toys and experimental outfits. All these things are typical of the outlook of the modern boy. He is no longer content, as his predecessors were, to be taken into a shop to choose a toy, but despises mere "playthings," and instead demands toys that appeal to his intellect and with which he can "do things."



This seemingly realistic alpine scene, with its solitary mountaineer, is really a product of table-top photography by H. Bastin, Reading. An article on this fascinating pursuit will appear in next month's issue.

The Age of Models

A few generations ago the books that set out to give boys some idea of the mechanical wonders in the world around them were dull and unattractive, and illustrated only by crude and uninteresting-looking drawings. The introduction of illustrations from photographs improved matters, but even the best photographs do not give an adequate idea of a machine, and their defects have led to the demand for actual models.

In his desire for models the modern boy is following the example of Lord Kelvin, the famous scientist and inventor, who once said that he always thought in terms of models. The immense popularity of the Meccano Dinky Toys has shown that boys are intensely interested in well-designed miniatures that they can examine and handle for themselves.

A Chance for Sharp Eyes

The illustration on this page is an excellent example of table-top photography that led to very curious results. When the photographer examined the print he was astonished to find on it the figure of a large animal, although of course no such creature had been intentionally included in the scene. Closer examination then revealed several other figures, especially on the right-hand side of the photograph. I think readers will find it interesting to look for these, and I will give copies of my book, *"Engineering for Boys,"* to the readers, one at home and one overseas, who find the greatest number of reasonably defined figures in this illustration.

It is not necessary to mutilate copies of the *"M.M."* in order to mark the figures discovered. Instead a piece of tracing or other sufficiently thin paper should be placed over the illustration and the figures detected outlined on it. The thick black line round the illustration also should be traced and the top of the tracing marked, in order to enable me to identify the figures shown. Entries from home readers should reach me on or before 31st December, and the closing date for those overseas is 30th March.

The "M.M." in 1935

Many readers of the *"M.M."* bind their copies into annual volumes, and in recent years the Magazine has grown to such an extent that some find these volumes too thick. I have therefore decided to place a proportion of the advertisement pages at the beginning of each issue, and for binding purposes those who wish can detach these and the corresponding pages at the end without interfering with the literary pages. The Magazine will appear in its new arrangement for the first time next month.

The World's Largest Canal Lift

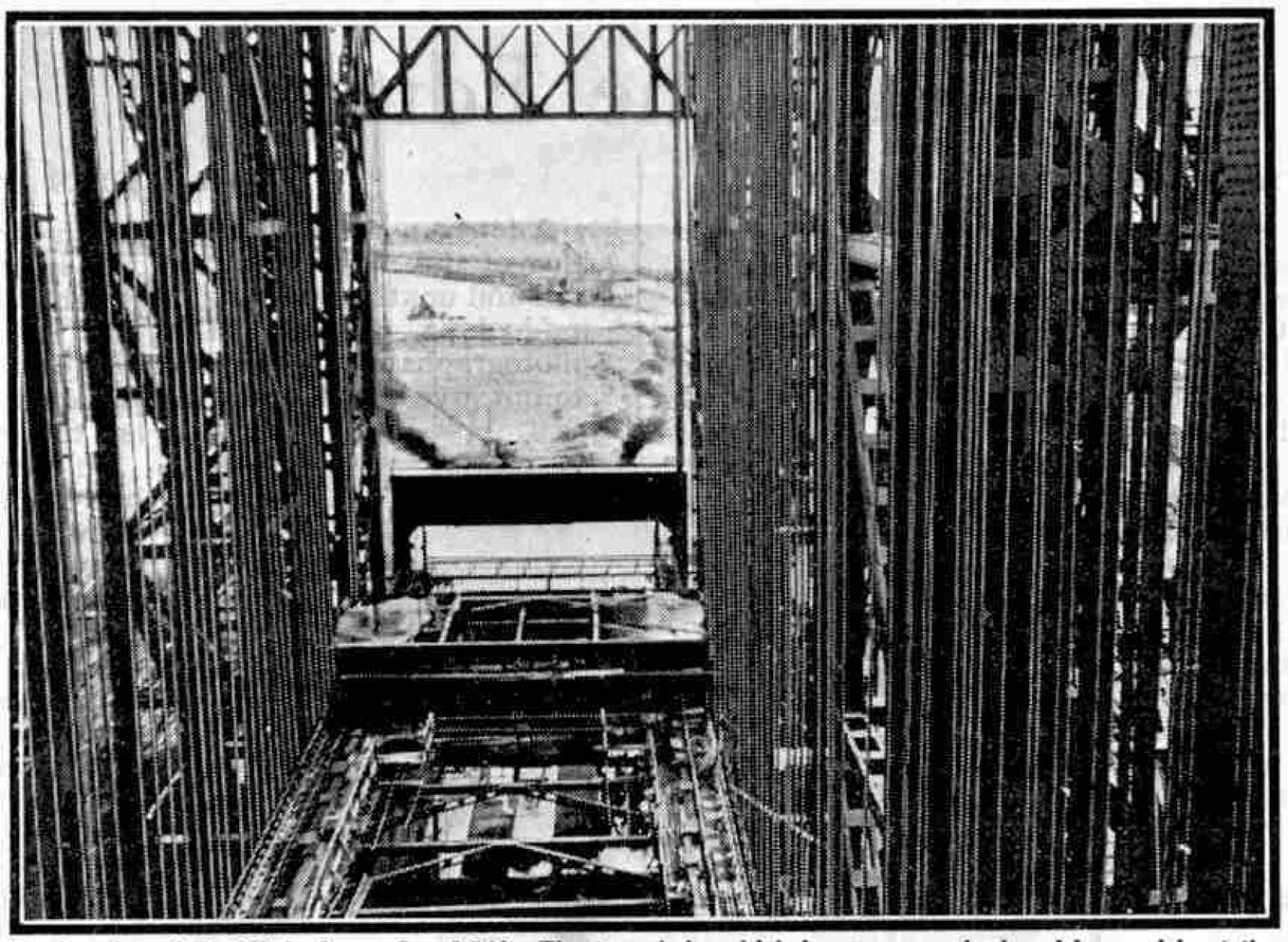
Electric Elevator for 1,000-Ton Barges

By H. F. Kutschbach

OUR cover this month shows the largest canal lift in the world. This has been constructed at Niederfinow, in Germany, and is capable of raising a 1,000-ton barge, or four similar vessels of 225 tons each, to a height of 116 ft. in five minutes. Its construction was begun in 1926 and it was opened on 21st March of this year.

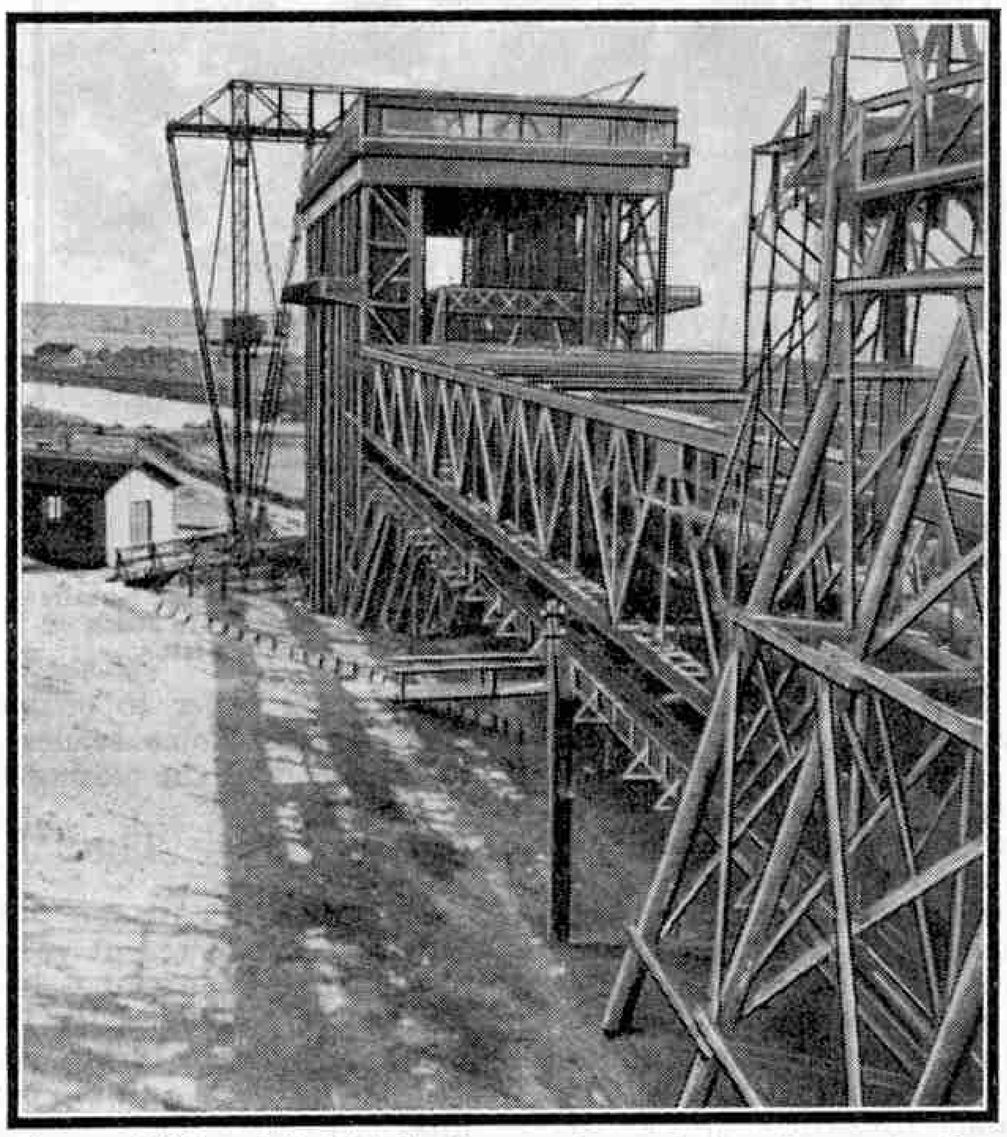
The Niederfinow lift has been built to facilitate traffic on the Hohenzollern Canal connecting Berlin and Stettin, on the Baltic coast of Germany. At the point where it is situated the canal passes from an inland plateau to the level of the lower waters of the River Oder, and before its construction the descent was made by means of a system of four locks. Two hours were required to negotiate this flight, and although two barges could be raised and two lowered at the same time, the slowness of the passage led to vexatious delays. Often more than 100 vessels could be seen waiting to pass through the locks, and at times barges were held up for several days before proceeding further on their inland voyage. This congestion is now avoided, for the time required to pass from one level of the canal system to the other has been reduced to 20 minutes.

The new lift will form an important link in the chain of waterways that cover Germany. Extensive use is made of canals in that country, and a gigantic project now nearing completion is the construction of the Mittelland Canal, which will connect the Rhine at Duisberg with the Hohenzollern Canal. When this work is finished barges up to 1,000 tons will be able to make the voyage right across northern Germany from the Rhine to the Baltic Sea and the River Vistula, and the combined waterways will connect the industrial region in the west of the country with Hanover, Berlin and Stettin.



The interior of the Niederfinow Canal Lift. The trough in which barges are raised and lowered is at the bottom of the structure.

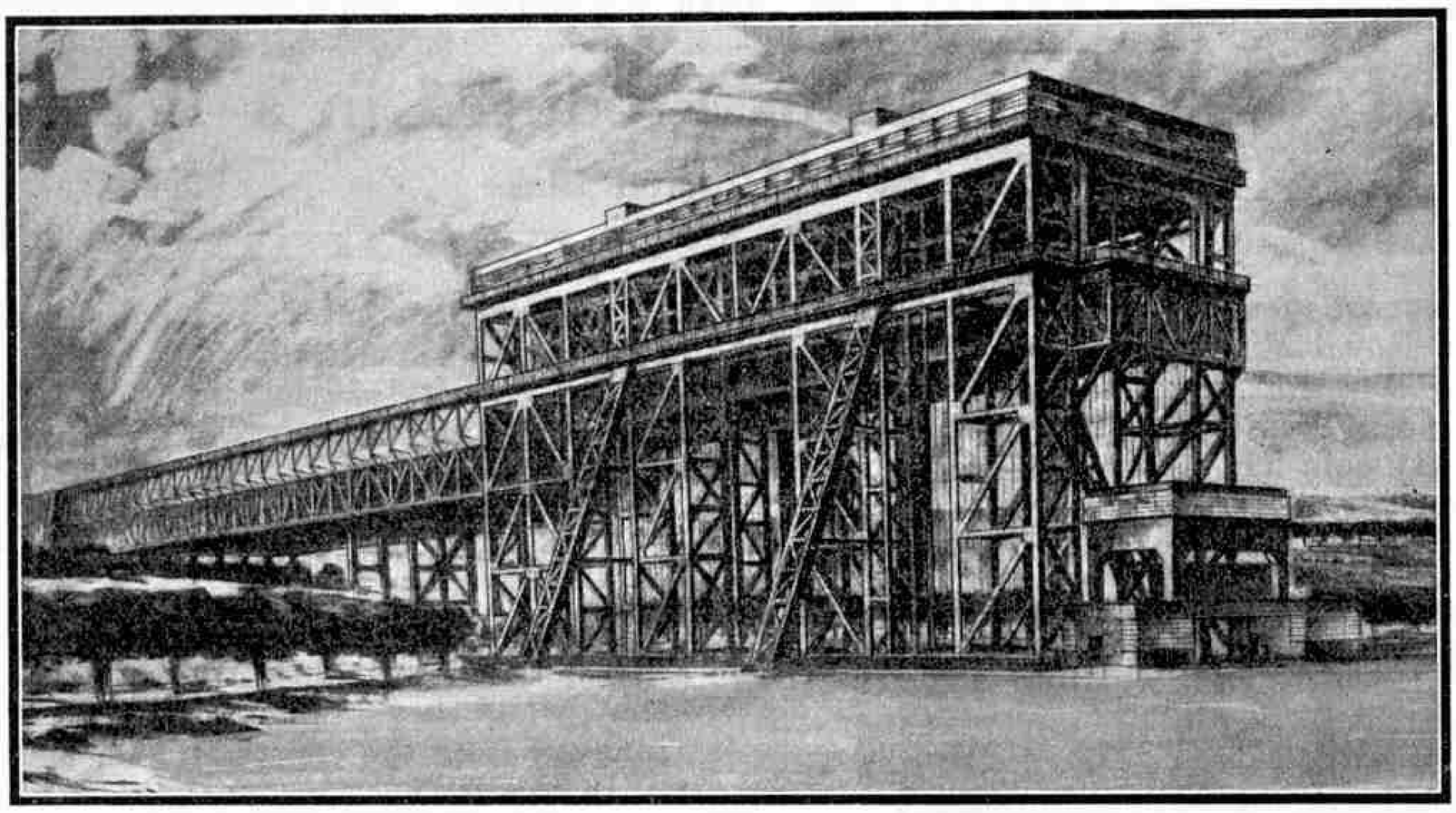
On the westward passage from Stettin barges pass up the Oder and are transferred to the Hohenzollern Canal at Niederfinow to complete their voyage to Berlin; and it is at the junction of the Oder with the Hohenzollern Canal that the ship lift has been constructed to replace the four locks previously used. Its giant framework carries a huge steel trough 278 ft. long and 40 ft. wide that holds water to a depth of 8 ft. 3 in. This enormous structure weighs nearly 4,200 tons, and as barges reaching the lift from the River Oder pass into it, steel doors isolate it from the canal and with its burden it is hoisted to the upper level by means of wire ropes. On arrival at the upper level similar doors at the opposite end are opened, and the barges are then able to pass on to an aqueduct that leads into a short branch canal giving access to the Hohenzollern Canal itself.



The canal lift and its high level approach aqueduct under construction.

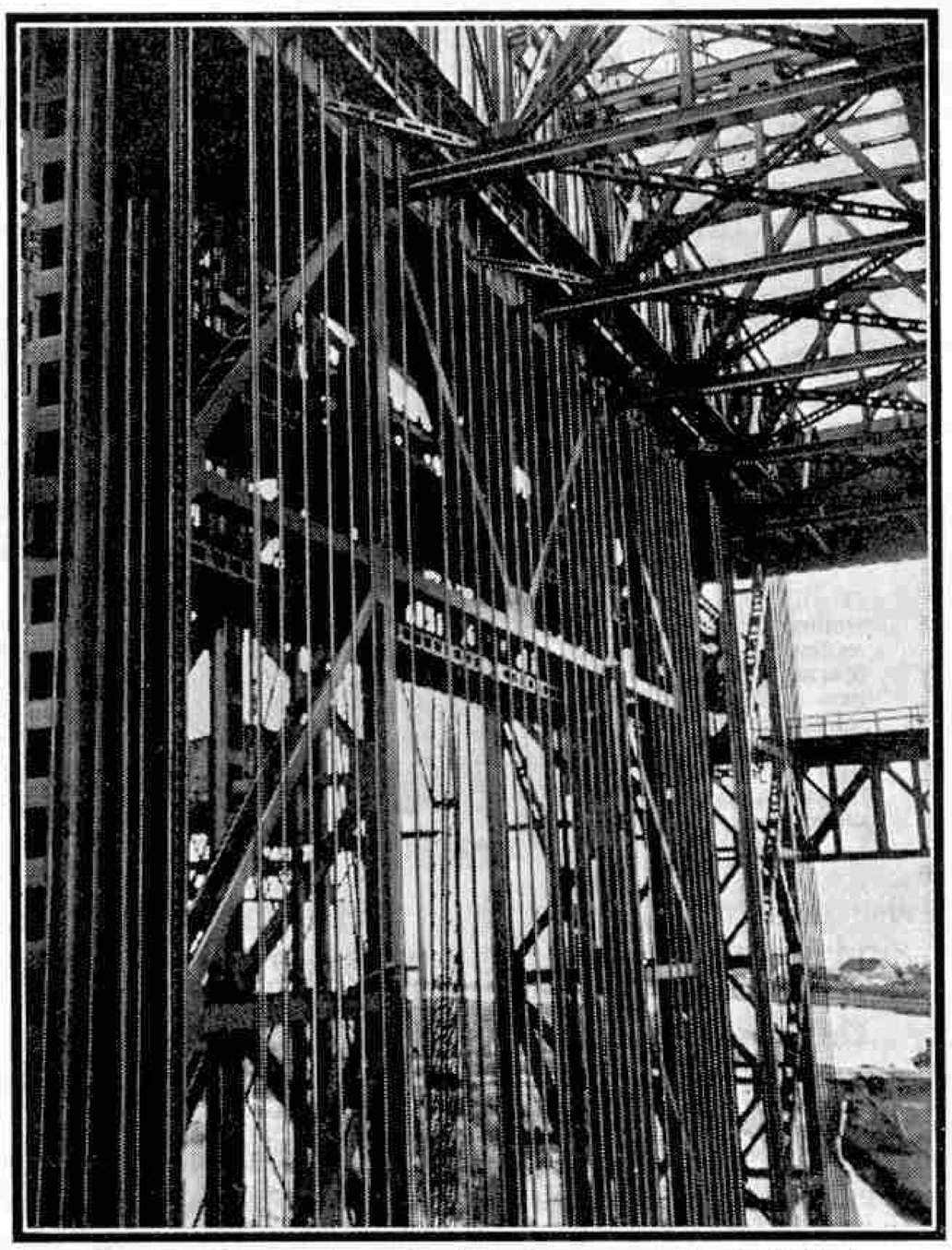
The entire structure contains about 20,000 tons of high quality steel, the use of which saved weight; and because of the marshy character of the ground on which it is built, an immense reinforced concrete raft had to be built to support it. The raft is 367 ft. 4 in. long, 108 ft. wide and 26 ft. deep, and it rests on nine concrete piers sunk into the earth to a depth of about 70 ft. The ground conditions made it necessary to provide special support for the aqueduct leading from the ship lift to the high level canal, and one of the

concrete piers supporting this aqueduct had to be carried more than 60 ft. below the level of the water in the subsoil in order to secure a firm foundation. Caissons accommodating 16 workmen were employed in sinking the foundations, and the air pressure within them was increased to nearly twice that of the atmosphere in order to prevent the entry of water. Operations were carried on day and night, and as work proceeded the sharp edges of the weighted caissons bored below the surface at the rate of one or two feet a day until firm ground was reached.



A general view of the Niederfinow canal lift in which 1,000-ton barges are raised or lowered 116 ft. in five minutes.

As our cover shows, the aqueduct and the framework supporting the lifting trough are of lattice girder construction. The trough is suspended from 256 wire ropes, 128 on each side, that are fastened to the upper booms of its main girders and led over double channel pulleys, 10 ft. 4 in. in diameter, to balancing counterweights. Each of these ropes is capable of sustaining a load of 150 tons, but carries only 22 tons when the lift is in operation. The distribution of the weight of the moving parts of the structure over such a large number of ropes greatly reduces the possibility of breakdown, for even if several of them were to collapse under the strain, those remaining have an ample margin of strength to cope with the additional burden that would be thrown on them. A further safeguard in operation is that the balancing counterweights are arranged in groups of six and carried in a frame, so that they cannot fall if a rope does break.



One side of the framework showing the wire ropes used to hoist the trough.

The counterweights consist of blocks of concrete about 24 ft. long, and the design of the lift allows them to be used with great efficiency. The total weight to be supported does not vary, since each barge entering the trough displaces its own weight of water from it, and thus an exact balance can be maintained between the moving parts of the lift. Even the transference of weight brought about by the movements of the wire ropes over their pulleys is allowed for by the installation of four special counterweights in the form of chains that connect the lower ends of the main counterweights with the underside of the trough. Each of these chains weighs about 22 tons, and they pass under the pulleys towards the trough as the wire ropes pass outward, or vice versa, when the lift is in operation.

The ends of the trough are closed by lift gates, and these are supported by the structure that carries the trough itself and the counterweights. Gates of the usual type are provided at the ends of the canals, and the two sets of doors effectively seal the trough and the canal respectively when the load is in position and the trough is to be raised or lowered.

The careful balancing of the moving parts of the lifts has reduced the power required for raising or lowering the trough, and four 75 h.p. motors mounted on the trough are sufficiently powerful for this purpose. The motors act through pinions geared to a rack on the supporting structure. They are designed to run at exactly the same speed in order to reduce the risk of causing the trough to slew or become jammed, and they are connected by means of a square shaft so that the load is taken up by the motors still in operation in the event of failure of one of them.

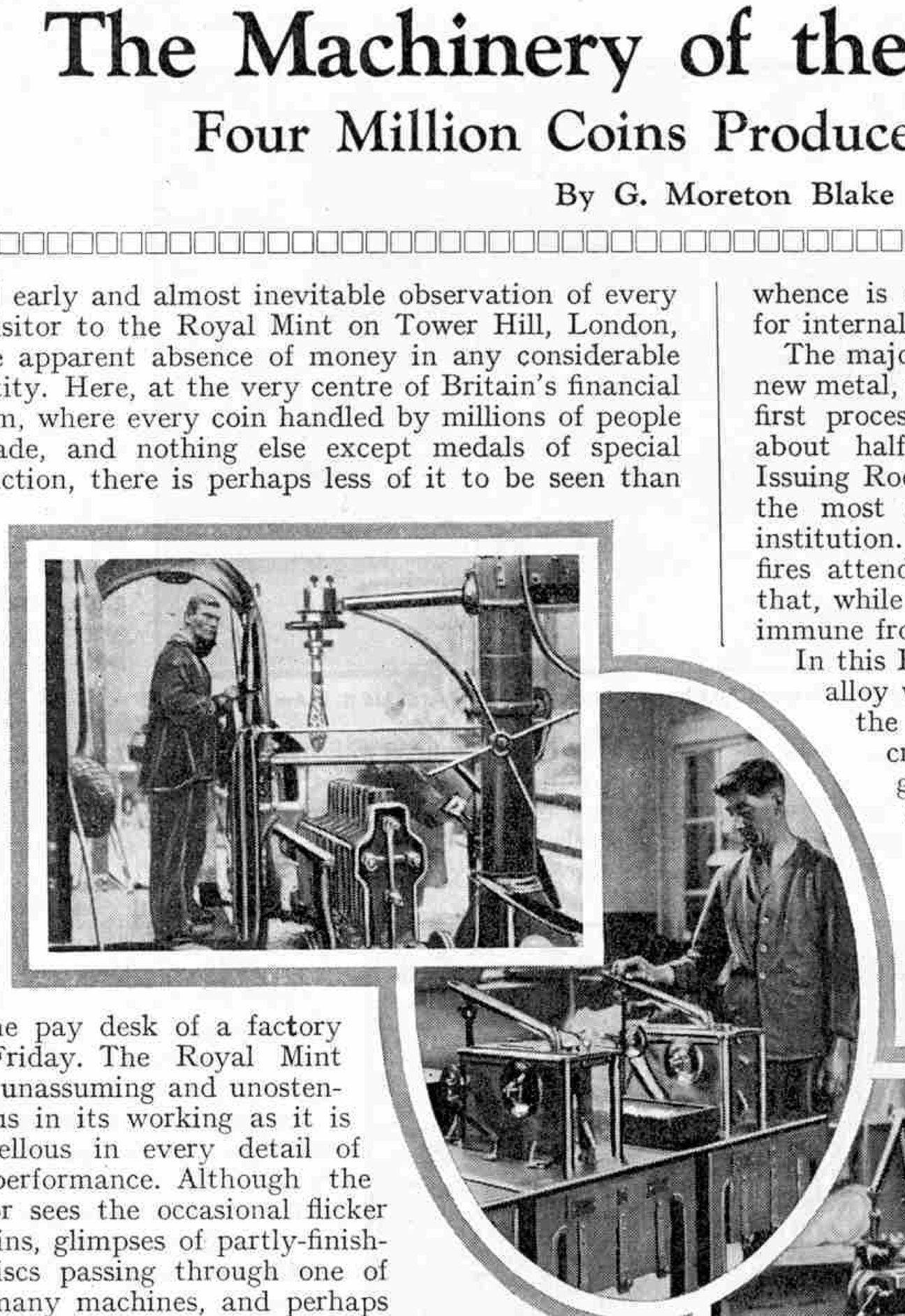
Safety devices stop the motors if any irregularity occurs in working. For instance, if the trough rises a little above its correct position at the higher level, and therefore is unable to take in its full depth of the water, the motors are switched off and the load is immediately transferred to the supporting structure. Any alteration in the weight of the moving parts due to this or any other cause must be corrected, and the balance restored, before the lift can be operated again. The trough moves upward or downward at a speed of 23 ft. per minute, about five minutes therefore being required to complete a single movement (*Continued on page 1026*)

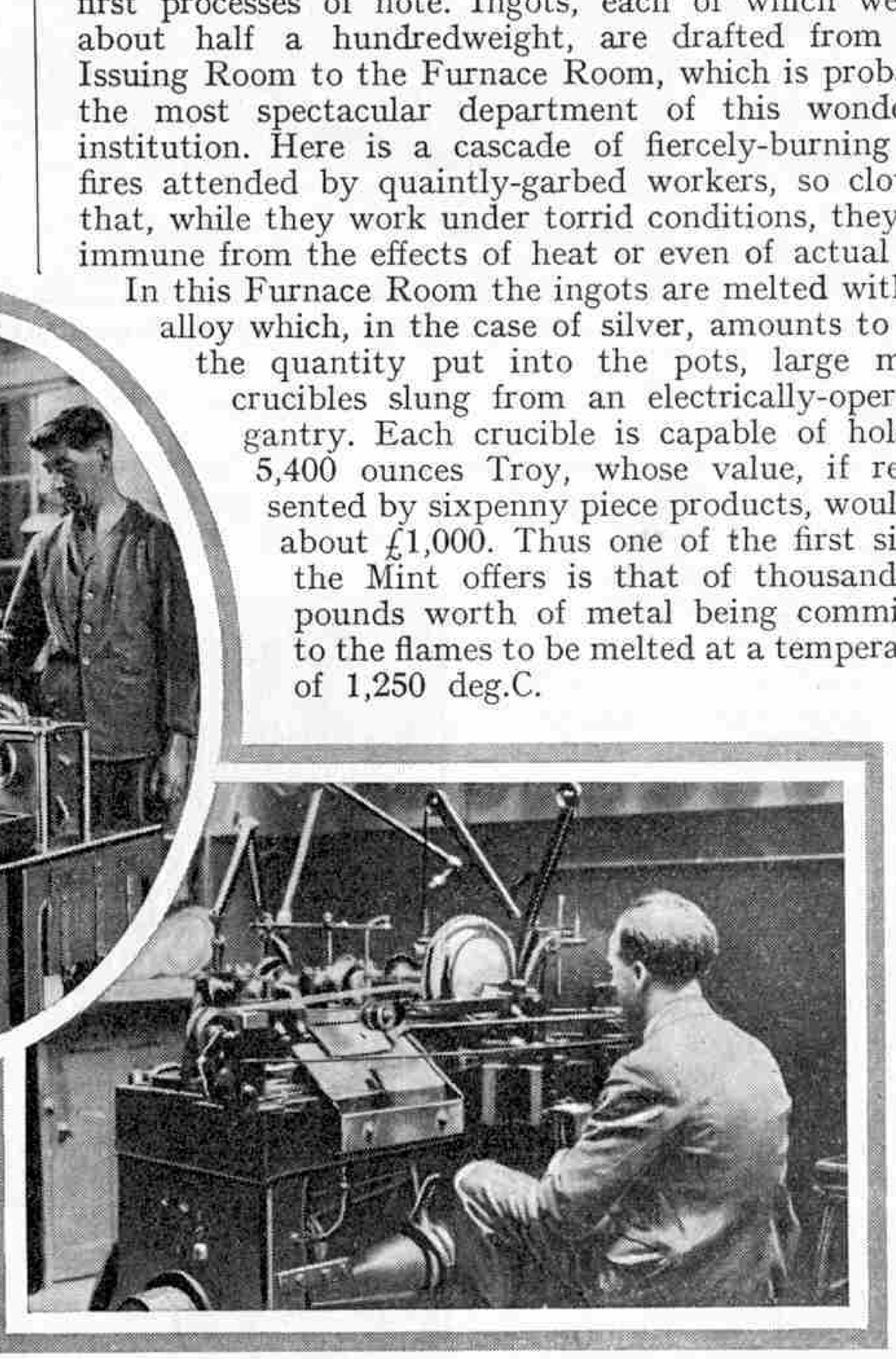
The Machinery of the Royal Mint

Four Million Coins Produced in a Week

By G. Moreton Blake

AN early and almost inevitable observation of every visitor to the Royal Mint on Tower Hill, London, is the apparent absence of money in any considerable quantity. Here, at the very centre of Britain's financial system, where every coin handled by millions of people is made, and nothing else except medals of special distinction, there is perhaps less of it to be seen than on the pay desk of a factory on Friday. The Royal Mint is as unassuming and unostentatious in its working as it is marvellous in every detail of its performance. Although the visitor sees the occasional flicker of coins, glimpses of partly-finished discs passing through one of the many machines, and perhaps some moderate-sized heaps of silver, he witnesses nothing spectacular enough to indicate that King George's money factory turns out nearly 4,000,000 coins or "pieces" during an average week.





(Top). Operator controlling the pouring of molten metal. (Centre). Machines that weigh new coins and automatically reject any that are a fraction of a grain below standard. (Bottom). Making service dies from "masters."

Engineers, metallurgists, chemists and other scientists have combined their energies to devise machinery that has become in a sense more and more secretive as it has been evolved from a crude commencement to what is now surely the most precise product of man's mind. The wonderful array of apparatus one sees at Tower Hill seems afraid to expose its purpose; but what at first might be a feeling of disappointment is soon dissipated by impressions of amazement before a visit has been long started. One soon recognises that this is truly the heart of Britain, drawing in the nation's besmirched circulation through a myriad of veins—the banks—mixing it with virgin metal and pumping out as it were new life blood, represented by glittering coins, through its main artery, the Bank of England, whence is distributed every British "piece" intended for internal circulation.

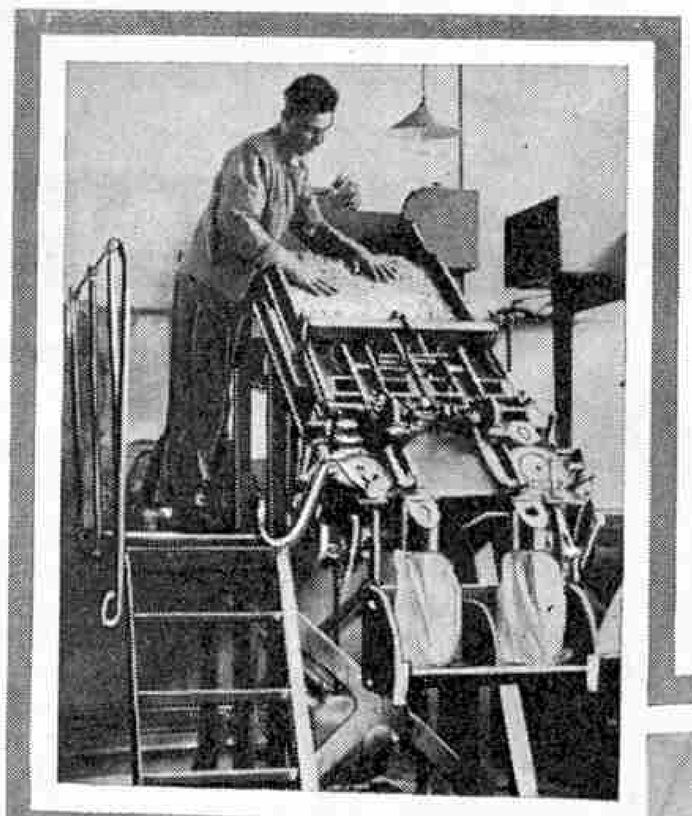
The majority of new issues, of course, are made from new metal, the treatment of which constitutes one of the first processes of note. Ingots, each of which weighs about half a hundredweight, are drafted from the Issuing Room to the Furnace Room, which is probably the most spectacular department of this wonderful institution. Here is a cascade of fiercely-burning gas fires attended by quaintly-garbed workers, so clothed that, while they work under torrid conditions, they are immune from the effects of heat or even of actual fire.

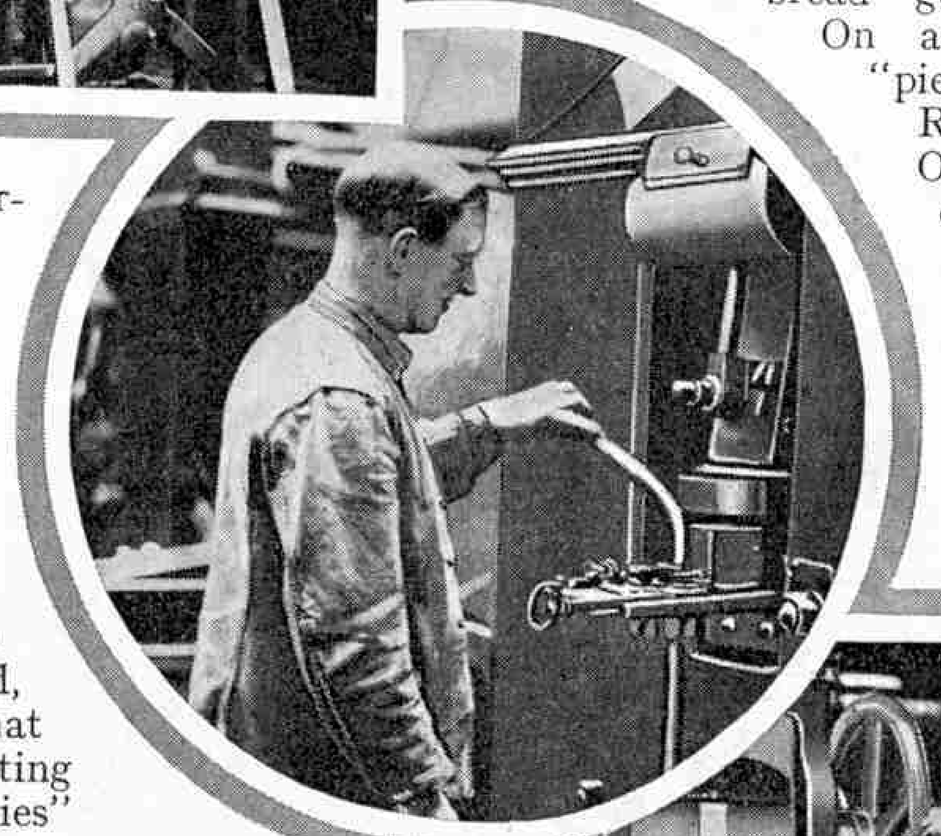
In this Furnace Room the ingots are melted with an alloy which, in the case of silver, amounts to half the quantity put into the pots, large metal crucibles slung from an electrically-operated gantry. Each crucible is capable of holding 5,400 ounces Troy, whose value, if represented by sixpenny piece products, would be about £1,000. Thus one of the first sights the Mint offers is that of thousands of pounds worth of metal being committed to the flames to be melted at a temperature of 1,250 deg.C.

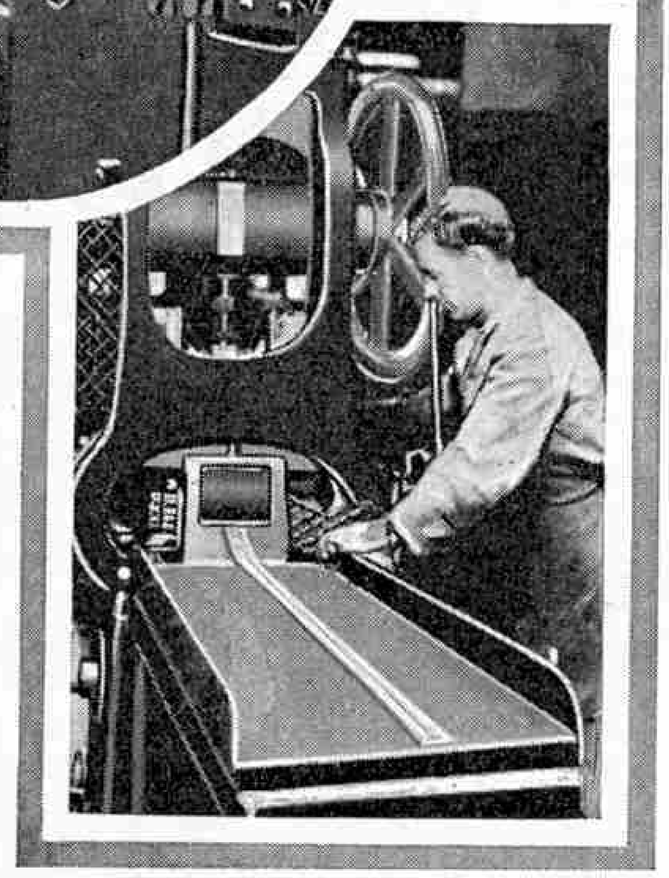
When the molten contents of a pot have been thoroughly mixed, workmen, by means of tackle, guide the crucible, after it has been hoisted from what appears to be a pyrotechnic display, to moulds into which the liquefied metal is poured to form bars approximately 24 in. in length, 2 in. wide and $\frac{3}{4}$ in. deep. These bars are almost immediately trimmed by a machine of enormous power, and before they have cooled are passed through rollers that press the metal into strips of the thickness required for coin making. These "fillets," as they are called, have to be heated again and annealed, so that they may become stronger and more durable, although somewhat softer. But for this annealing process coins would be brittle, and would break before they had been long in circulation. At this point very exacting tests are carried

out in the Mint's laboratories, and it is not until every batch of fillets is passed as correct that they are turned into coins.

Now a machine punches out blanks just as easily as though silver-copper alloy were dough. These blanks roll down a chute in a continuous stream that looks like a column of mercury, falling into presses that form another remarkable part of the Mint's equipment. In machines whose appetite seems to be insatiable, the blank pieces are subjected to a pressure equivalent to 1,000 tons to the square inch, as dies simultaneously punch upon their obverse and reverse sides the required impressions. The enormous pressure necessary to effect this can be appreciated when it is stated that at this point the metal is stone cold. Nevertheless each impression is perfect in every detail, as one may realise from careful inspection of a new coin.







(Top). Coins being automatically counted as they are packed. (Centre). Punching the impressions on blank discs. (Bottom). Stamping the discs from "fillets."

The dies used in this wonderful apparatus are made from "masters," that are prepared with extreme accuracy. A sort of stylus, "feeling" the master die, controls the cutting point operating on what will become the service die, which is the exact size of the coin concerned, and whose likeness is eventually that of its parent. It is in this interesting department that the Mint's "babies" are born.

The coins are still not ready for circulation. During manufacture they have become dirty and perhaps covered with oil; and as the Mint is most particular as regards their appearance, they are thoroughly cleaned in revolving acid baths and then thrown into sawdust and dried in hot air.

Even yet they cannot be passed as finished. The Mint is so particular with regard to giving us our money's worth that every "piece" is individually weighed by automatic apparatus that rejects any coin that is a fraction of a grain away from the standard. The machines that discharge this very delicate operation are comparatively slow, and several of them have to be kept continuously at work in order that a high daily output may be checked. If the number of rejected coins is beyond the average, it is assumed that the action of the acids used in the cleansing process has been too strong and is removing too much of the surface metal, in which case corrections are made.

One of the final processes is that of "viewing." As a never-ending stream of new coins pass before them on a cleverly-devised endless belt, keen-eyed observers look for any coin that might bear an abrasion or a scratch, or are imperfect in any particular. Those that survive this test proceed on the last stages of their journey; those that fail are removed and suitably dealt with.

Money is not counted at the Mint in the ordinary way, there is not time for that. When ready for packing, the coins are taken to chutes at the heads of which they are placed in quantities that provide one of the few occasions on which a mass of money can be seen at one time. As they fall they are automatically checked, and immediately a required number have deposited themselves in the bags the mechanism ceases to operate. These machines never make a mistake.

The side issues of minting are almost as interesting as are the main processes. For instance, we learn that the weight of a sixpence when new should be exactly one-eleventh of an ounce Troy, but that when it has been in circulation for a normal period it will have lost 3.46 of its weight. It gets many a rub during its life!

With a callous disregard of the black looks that greet us when we tender a threepenny piece, the Mint makes 7,000,000 of these coins a year. Not content with this, it turns out 4,500,000 farthings for the benefit of drapers who use them to make their price tickets look more alluring, and bakers who find them useful when bread "goes up."

On an average nearly 200,000,000 "pieces" or coins pass through the Royal Mint in the course of a year. Old, worn and defaced money withdrawn from circulation, amounting in value to £2,137,000, is re-smelted during a similar period. Sooner or later every coin that has been made returns to the place of its "birth."

Nothing is lost from the Mint—it cannot be. By means of a system of daily stocktaking, in the course of which every coin and every ounce of metal is checked into and out of every department concerned in its handling, and by the operation of marvellously accurate methods of weighing, the loss of a sixpence would be indicated, as well as the point at which it disappeared. Every person and everything is constantly under observation. "Keep looking" is one of the slogans observed in London's money factory; and this might be changed to "keep locking" in so far as the doors are concerned, for they lock themselves as they close, and only those entitled to leave can do so. Every person, like every coin, is counted in and counted out. There has to be no balance! But the officials are proud to declare that of all British institutions the Mint's record for honesty is perhaps the best.

The post of Master of the Mint is held by the Chancellor of the Exchequer, but the actual superintendence of the Mint is in the hands of the Deputy Master and Comptroller.

Hydro-Electric Crane Without Cables

In a small mobile electric crane that has recently been developed, the usual cables and chains by which loads are raised have been replaced by a hydraulic ram which, it is claimed, will ensure greater safety in operation and also reduce the risk of failure.

The crane is intended for dealing with goods in restricted places in factories, warehouses, docks, ships, etc., and it consists of a chassis of the usual truck type mounted on two axles, both of which are fitted with steerable wheels. The jib is carried at the front of the undercarriage, and it consists of steel girders mounted on a pivot bar. It can be moved from a position below horizontal to an angle of about 35 deg. by a vertical hydraulic ram. The hook at the end of the jib can be made to travel from a distance of 3 ft. in front of the carriage to 7 ft., while the vertical lift is between 1 ft. 6 in. and 10 ft. 6 in. above the ground. Both these actions are carried out by a second ram that moves an extending girder carrying the hook. A 1½ h.p. motor drives a rotary high-pressure oil pump that in turn delivers the oil to the two rams as required. The slewing is done by hand, the jib being mounted on a framework of girders mounted on ball bearings to facilitate this operation.

The driver's platform is arranged at the rear of the undercarriage, with controls giving three forward speeds and reverse, in addition to a steering tiller, and a main switch operated by a "dead man" pedal that automatically applies the brakes when the foot is taken off it. The crane is driven by a 2½ h.p. motor working at 30 volts, the current being supplied from a battery carried in the undercarriage, which has a range of about 11 miles per charge.

An impressive view of the lift bridge at Barendrecht, Holland, one of the largest of its kind in Europe. A giant Meccano model of this bridge, built by a Belgian boy, will be described and illustrated in our February issue. Photographs on this and the opposite page by courtesy of Werkspoor N.V. Amsterdam.

Steel Roads Proposed for South Africa

It has been proposed by South African engineers that in future roads in the Transvaal Province should be made of steel. They claim that although such roads would be more expensive to build than are tarred roads, they would never wear out, and consequently would save a great deal of money in the long run.

As solid foundations would not be necessary for such roads, the method of construction followed would be to level the surface of the ground over which the road was to be driven, and then to lay down steel plates half-an-inch in thickness, which would then be welded together. In order to prevent the steel from rusting, a thin layer of asphalt would be spread on top of the plates. The scheme seems particularly suitable for Africa, where there is so much undeveloped country.

Big Australian Dam Completed

Work has been finished on a big Australian dam, known as the Hume Dam, which impounds the head waters of the River Murray. This river, which rises in the Southern Alps, forms for a considerable distance the boundary between the states of New South Wales and Victoria. The dam has been built across it at a point near the small township of Albury, and the reservoir thus formed has a capacity of 1,250,000 acre-feet, water draining into it from an area of 5,900 sq. miles. The water is to be used for irrigation purposes.

The dam is 3,600 ft. in total length and 90 ft. high at the tallest point. On the New South Wales side it consists of a concrete structure with a spillway built on solid granite, while on the Victoria side the impounding wall takes the form of an earthen embankment with a core wall of concrete 2,700 ft. in length. The work of building the dam has occupied three years and cost £5,500,000. It is hoped later to increase the capacity so that the reservoir will hold 2,000,000 acre-feet of water. This will be done by erecting on the concrete spillway a number of piers to carry 29 steel lifting gates each 20 ft. wide by 15 ft. high.

A Danish Viaduct Scheme

Danish engineers are investigating a proposal for the construction of a land connection between Sealand and Fyen across the Great Belt, a channel 11 miles in width, in order to shorten the journey between Sweden and Denmark. The bridge would cost about £6,255,000 and would save more than £125,000 a year. At present traffic between the two countries has to make the journey by ferry.

Work on other schemes in Denmark to speed up traffic is making great progress, bridges over the Little Belt and the Storstrommen being well advanced.

The Institute of Marine Engineers

All apprentices and students who wish to become marine engineers should endeavour to qualify for membership of the Institute of Marine Engineers. The first step is to become a Student Member of the Institute, which can only be done as a result of examination. Applicants for admission to the Student Section must be under 25 years of age and have completed at least one year of attendance at day or evening classes at an approved educational institution, as part of a regular course of training in the science of engineering or naval architecture. The possession of certain degrees or diplomas exempts the holder from sitting for the preliminary examination.

Arrangements are now being made for the next annual examination for admission to the student class of membership, which will be held in May 1935 at various centres, and full particulars of the syllabus and the exemptions that are allowed, may be obtained on application to the Secretary, the Institute of Marine Engineers, the Minories, London, E.C.4.

World's Longest Concrete Arch Bridge

The new Traneberg Bridge that spans the harbour at Stockholm is claimed to have the longest arch span built of reinforced concrete in the world. This is about 585 ft. long, and including the viaduct and approaches the bridge is about 1,900 ft. long. The span has been built so that for about 145 ft. at its centre there is a clear head room for shipping of about 85 ft. above mean high water level. The bridge carries a roadway and a two-track electric railway.

There are numerous features of interest about the bridge, one being that, as it lies almost due east-west, the superstructure on the south side will experience much greater changes of temperature than that on the north, and consequently special provision has had to be made for compensating the different expansions.

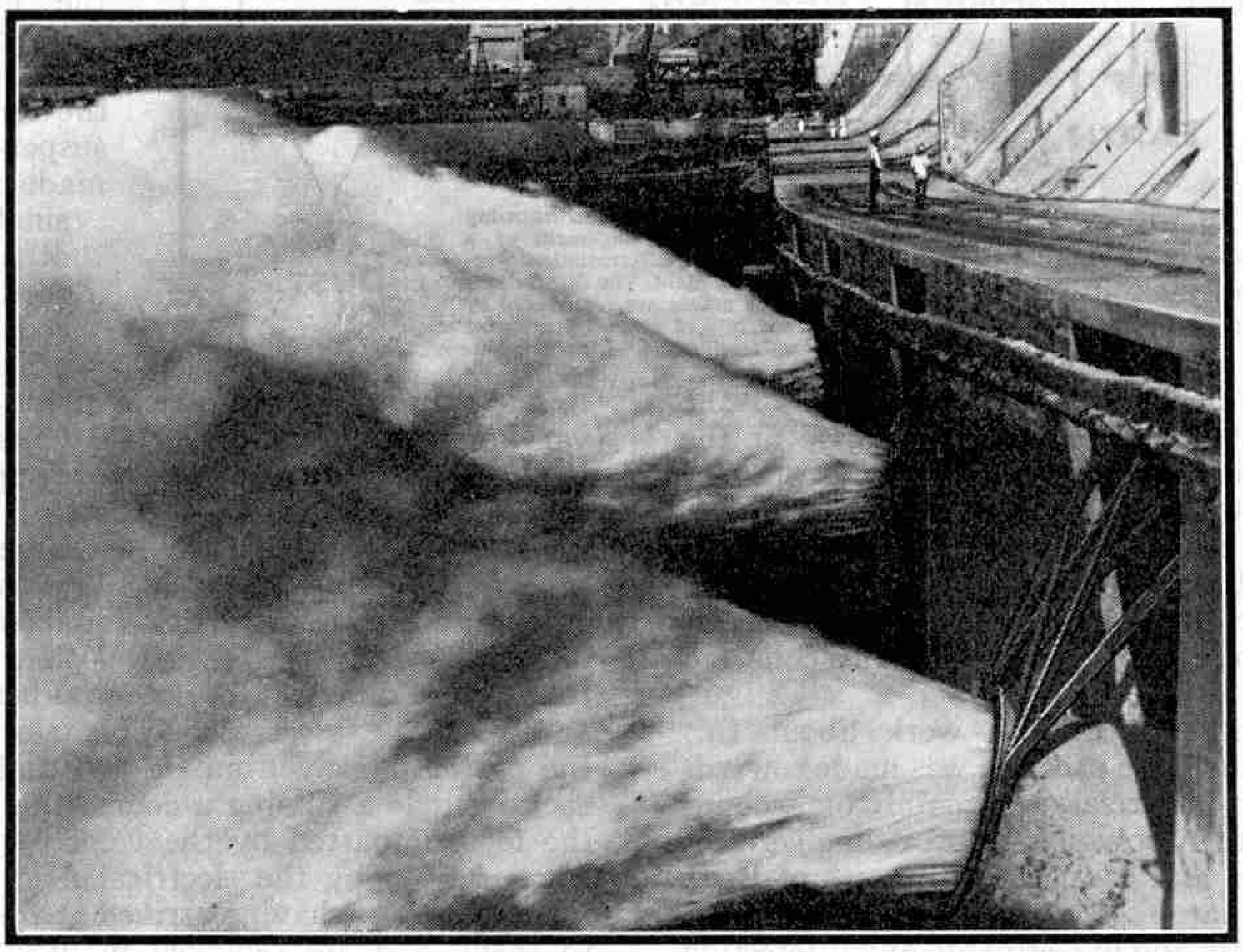
The bridge has been constructed in connection with an ambitious and costly scheme of development that is being carried out in Stockholm. The scheme provides also for a bridge to be built across Lake Mäloren, about two miles from the centre of the city, and work has proceeded so rapidly on this that it is expected to be finished in about a year's time. Roadways in the vicinity also are being improved, particular attention being paid to the only road that joins the north and south sides of the lake.

Another view of the Barendrecht Bridge, showing the lift span in the raised position.

An Interesting Cargo Liner

An interesting fast new liner for the transport of refrigerated cargo has been built by Harland and Wolff Ltd., for service on the London–New Zealand route of the Shaw, Saville and Albion Co. Ltd. The vessel has been named the "*Waiwera*," and a special feature is that it is provided with exceptionally large oil fuel tanks arranged in the double bottom and hull spaces. After being fuelled at Panama the vessel will be able to proceed to its destination at Port Chalmers in New Zealand, return to London by way of Cape Horn or the Panama Canal, and then go back to Panama, on one fuelling. The vessel is the first of three sister ships that have been ordered.

The "*Waiwera*" is 535 ft. 6 in. in overall length and 70 ft. in moulded breadth, and has a displacement of 10,760 tons. She has a designed service speed of about 16 knots, and carries 12 passengers. The refrigerator space available amounts to 500,000 cu. ft. A rather unusual feature is that although the vessel is almost wholly given up to the transport of cargo, a doctor is always carried.



Three 72 in. diameter Glenfield Jet Dispersers discharging under 80 ft. head at the Cauvery Metur Dam, India.

3,200-Mile Road for United States

Survey work is now being carried out with a view to constructing a continuous public highway that would be capable of carrying motor cars and other vehicles at all times of the year, from the United States boundary through Mexico and Central America to the city of Panama. If the road is built it will be the preliminary to a highway going right through the states of South America.

Some of the existing roads would of course be included in the new highway, although at present only about 1,265 miles, in intermittent stretches, are good under all conditions of weather, 535 miles being definitely impassable under any but the dryest conditions. Along another 560 miles of the route there is no road at all, although in some places there is a marked trail.

Plans and estimates have been prepared for the construction of the 1,985 miles where there is no first-class highway, the cost being put at about £12,000,000. A large sum has already been advanced by the United States Government, and it is expected that some part of this will be used to purchase road-making machinery. The finished road will be 28 ft. wide and will have a paved or surfaced width of 18 ft. Gradients will be kept to a maximum of 1 in 14.3, and curves to a minimum radius of 164 ft.

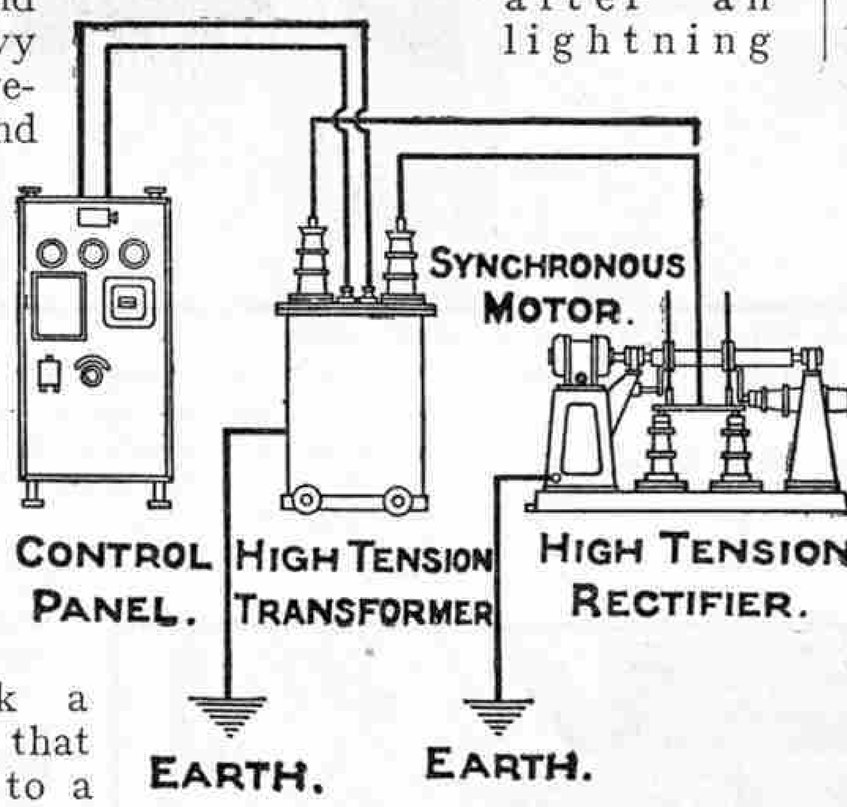
It is to be hoped that the road will be built for it would be of value for trade, and in particular the tourist traffic which is quite undeveloped in Central America.

Removing Dust from Gases

Electrical Separators Charged to 80,000 Volts

THE idea of removing very fine particles from gases by electrostatic means is an old one. As early as 1819 C. S. Rafinesque, of Paris, described in an article the origin and character of atmospheric dust, and mentioned that an electrified stick of sealing wax would attract this dust even at a considerable distance. He also noticed that dust is a most sensitive indicator of the presence of an electric charge.

Five years later Hohlfield, the mathematician of Leipzig, called attention to the possibility of precipitating smoke by means of an electric charge. He stated that: "Usually during a thunderstorm the amount of rain falling is increased immediately after a discharge of lightning, and especially heavy discharge hail frequently falls, and with repeated discharges this hail increases in volume." Hohlfield also carried out some experiments by filling a flask with smoke, and then inserting into the flask a pointed wire that was connected to a source of electric supply. As soon as the wire was charged the smoke in the flask was precipitated.

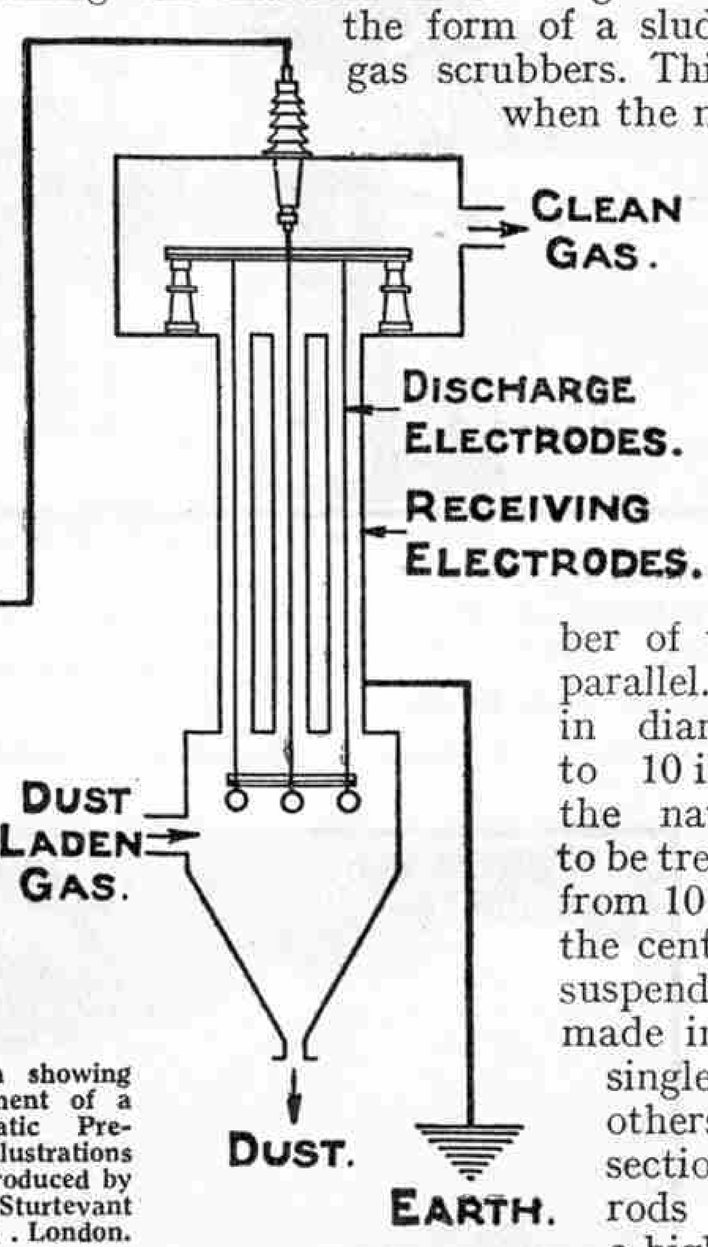


A simplified diagram showing the general arrangement of a Sturtevant Electrostatic Precipitation plant. The illustrations to this article are reproduced by courtesy of the Sturtevant Engineering Co. Ltd. London.

It was noticed also by G. F. Guitard in 1850 that if an electrically charged wire was inserted into a smoke-filled cylinder the smoke would immediately fly to the sides of the cylinder. He also noted and expressed surprise at the fact that a small quantity of electricity would produce relatively large effects. This led later investigators to make quantitative measurements of the electrical discharge from smooth thin wires suspended in tubes, and in 1866 Gaugain, in the course of his experiments, noticed that dust from the atmosphere was collected on the tube walls.

Other investigators took up the work about this time, but for some years little progress was made towards applying the idea to commercial uses, mainly on account of the difficulty that then prevailed of providing suitable high-tension machines and insulators. In spite of these difficulties, however, large-scale experiments were carried out in Great Britain and in Germany, and interesting results were obtained; but it was not until the early years of the present century that electrical technique advanced to such a point that a reliable supply of direct current at from 40,000 to 50,000 volts could be supplied. After this the future of electrostatic precipitation was assured, and it was not long before plants were installed in numerous industries, especially in connection with acid works, cement works, and metallurgical plants.

Electrostatic precipitation provides a method of cleaning industrial gases to a degree of fineness that is very difficult to obtain by any other method such as filters, scrubbers, etc. It is also a means of obtaining the material in its original state, and not in the form of a sludge, as is usual in gas scrubbers. This fact, especially when the material is of some value, represents a distinct saving in the cost of recovery.



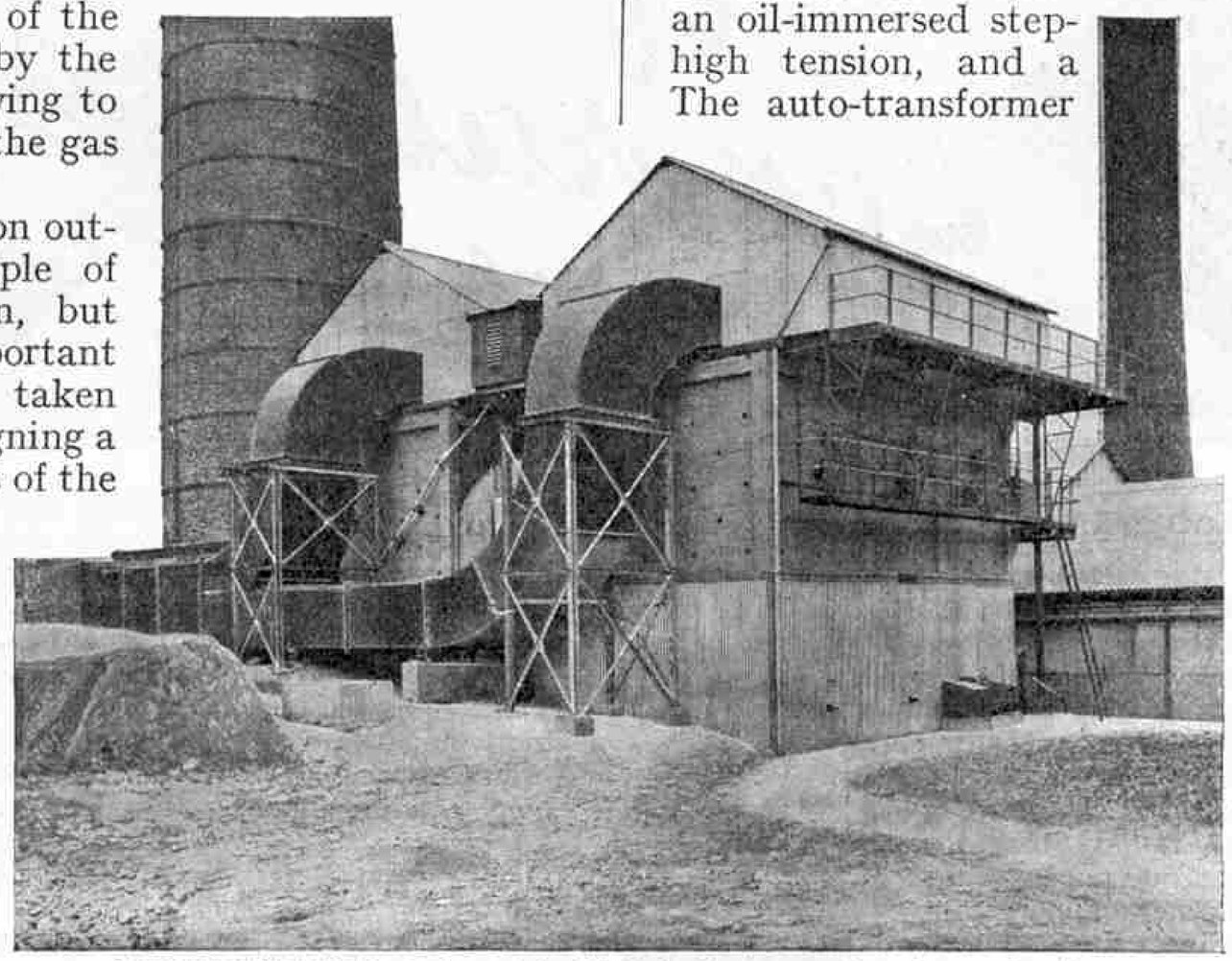
The precipitation is usually brought about by passing the dust-laden gas through a number of tubes arranged in parallel. The tubes vary in diameter from 6 in. to 10 in., according to the nature of the gas to be treated, and in length from 10 ft. to 14 ft. Down the centre of each tube is suspended an electrode, made in some cases of a single thin wire, and in others of rods of various sections. These wires or rods are connected to a high-tension electrical source of supply that produces direct current at pressures varying from 30,000 to 80,000 volts.

The tubes and casing of the precipitator are earthed, so that there is a high potential difference between the rod that is termed the discharge electrode, and the tube or receiving electrode. As soon as the dirty gas enters the tube each particle is subjected to an electrical force caused by the electrical field set up inside the tube by the difference of potential between the discharge and receiving electrodes. This electrical force drives the particles away from the rod and towards the tube, each particle assuming a course that is the resultant of the force imparted by the velocity of the gas and the force created by the electrical field.

The particles, having arrived at the tube walls, adhere to them, and are removed in most cases by rapping. Some particles will fall of their own weight when a layer of sufficient thickness has been built up, but it is usual and safer not to trust to this, and therefore to supply a rapping device. The material removed from the tube walls by the rappers falls into hoppers at the bottom of

the precipitators, where it is removed by some suitable means, such as a screw conveyor. In the case of liquids, these trickle down the sides of the tubes, and no rapping device is necessary. There is little danger of small precipitated particles, when falling at the inner face of the tubes, being caught up by the ascending gas stream, owing to the very low velocity of the gas at the tube surface.

The foregoing description outlines the general principle of electrostatic precipitation, but there are various important factors that have to be taken into consideration in designing a plant. The characteristics of the gas and of the solid or liquid particles carried by it must be studied closely before a plant can be designed successfully. For instance, precipitators dealing with cement from dry or wet processes, pyrites, acid mist or grits, all present different problems, and the plants are of somewhat different design for each type.

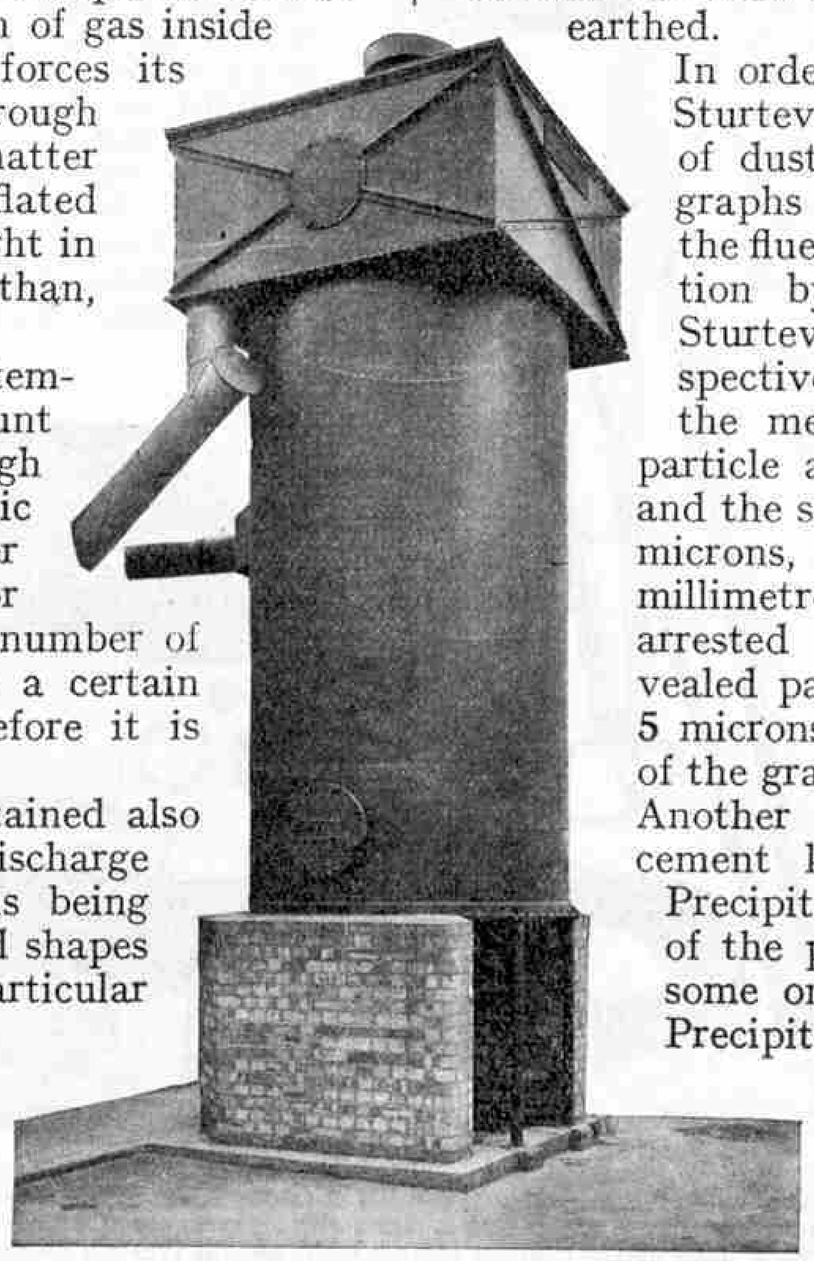


Sturtevant Precipitator equipment installed at a large cement works near London.

The size and structure of the particles are of considerable importance, as may be seen when the characteristics of powdered fuel grits are studied. A large proportion of this dust consists of hollow spheres termed cenospheres, caused by the formation of gas inside the small coal particles. This gas forces its way out of the particle, usually through one small hole, leaving the solid matter very much in the form of an inflated football. Such a dust is extremely light in weight, and is more difficult to trap than, say, a cement dust particle.

Other important factors are the temperature of the gases, and the amount of moisture contained in them. Although a dry gas has a much higher dielectric strength than a wet gas, the former is much more liable to flashovers for any given voltage; and in fact in a number of special cases it is necessary to add a certain amount of moisture to the gas before it is admitted to the treater.

Great variations in results are obtained also by the use of various types of discharge electrodes, and continual research is being made into the most efficient sizes and shapes of rod or wire for dealing with particular problems.



A typical Sturtevant Precipitator for dealing with industrial fumes.

The Sturtevant Engineering Co. Ltd., to whom we are indebted for our information, have installed large numbers of electrostatic precipitation plants for a variety of industries. The success of these plants shows that the principle is capable of application to every industry where, in the ordinary way, gases are blown into the atmosphere carrying valuable dust and mist, or creating a nuisance. It has been shown that up to 99.9 per cent. of the gas-carried particles can be precipitated.

The best results in precipitating dust by the electrostatic method are obtained by the use of direct current of negative sign. The Sturtevant equipment consists essentially of a low-tension auto-transformer, an oil-immersed step-up transformer for the high tension, and a high-tension rectifier. The auto-transformer is of the ordinary type and is used to vary by small steps the input voltage to the step-up transformer. This piece of apparatus produces the high-tension alternating current and is of the usual kind except for its power to withstand the high frequency waves produced by the rectifier. The rectifiers generally used are of the mechanical type, so built that it is practically impossible to overload them electrically, while at the same time they are not liable to mechanical failure. All high-tension equipments are fitted with devices to prevent interference with radio reception. Complete mechanical and electrical interlocks are also provided, making it impossible to enter the screened area or the precipitator until all current has been switched off and the whole apparatus earthed.

In order to compare the performance of the Sturtevant Precipitator with mechanical types of dust collectors, a series of micro-photographs were taken of dust extracted from the flue gases of a pulverised fuel fired installation by a mechanical precipitator and a Sturtevant Electrostatic Precipitator respectively. Examination showed that with the mechanical system the largest size of particle arrested measured 150×100 microns, and the smallest particle approximately 60×40 microns, a micron being one thousandth of a millimetre. The photographs of the dust arrested by the Sturtevant Precipitator revealed particles ranging in size from less than 5 microns to 225 microns, however, and some of the grains were only one micron in diameter. Another micro-photograph of dust from a cement kiln flue collected in a Sturtevant Precipitator showed that the average size of the particles was under 10 microns, with some only one micron in diameter, yet the Precipitator collected without difficulty up to 98 or 99 per cent. of the total dust content of the gases passing through the flue.

The Sturtevant Engineering Co. Ltd., have installed a special demonstration Precipitator plant in London. When dust laden gas is passed through the system with the precipitator out of action, the exhaust is cloudy and opaque, but with the same amount of dust and gas and with the precipitator working the exhaust is visually clear of dust.

Taking 2,500 Photographs a Second

On page 772 of the "*M.M.*" for October last I explained how photographs of the bursting of soap bubbles and the breaking of glasses by bullets have been taken with exposures as short as one hundred-thousandth of a second. Specially designed apparatus is necessary for photographic feats of this kind, and in that employed for this purpose the bullets actually make the exposure by causing miniature lightning discharges.

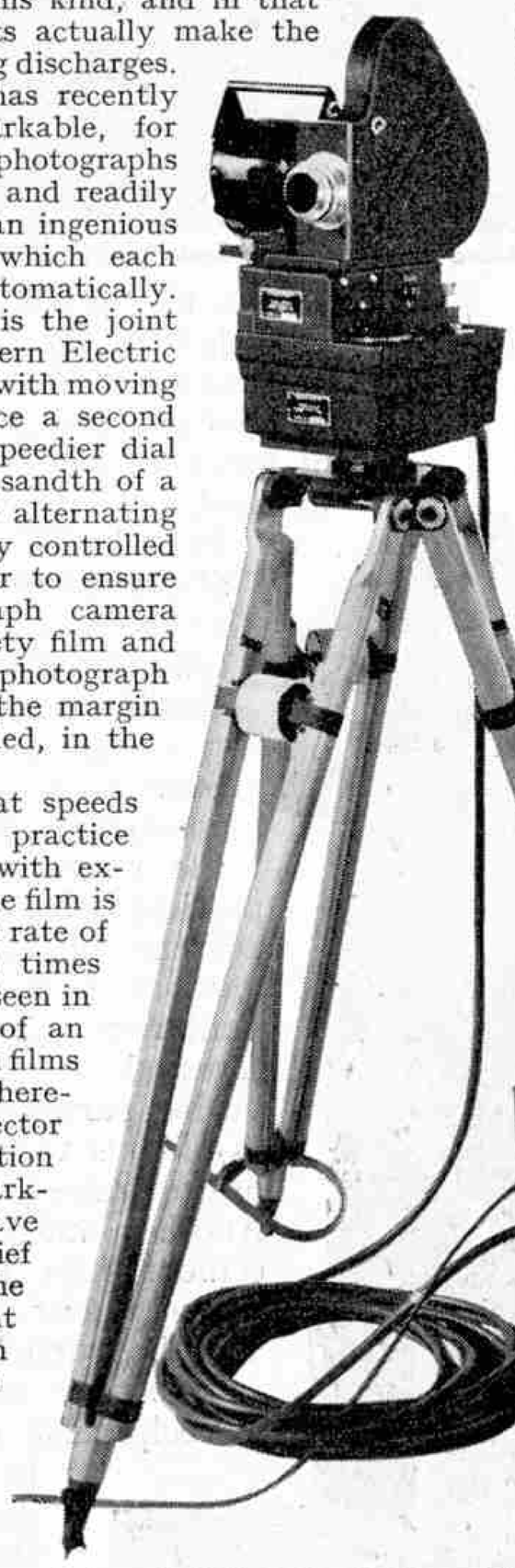
A new cinematograph camera that has recently been produced is even more remarkable, for although it can take as many as 2,500 photographs in a second, it is standard equipment and readily portable. In addition it incorporates an ingenious mechanism to enable the time at which each photograph is taken to be recorded automatically.

This wonderful high-speed camera is the joint product of Kodak Ltd. and the Western Electric Company Ltd. In it is an electric clock with moving dials rotating once a minute and once a second respectively, and subdivision of the speedier dial enables the time to be read to a thousandth of a second. This mechanism is driven by alternating current at a frequency that is strictly controlled by means of a turning fork in order to ensure complete accuracy. The cinematograph camera itself uses standard 16 millimetre safety film and has two lenses so arranged that a photograph of the dials of the clock is taken in the margin of each picture, or frame as it is called, in the complete film record.

The camera is designed to work at speeds up to 2,500 pictures a second. In practice excellent results have been obtained with exposures of 2,000 frames a second and the film is then passed through the camera at the rate of 50 ft. in a second. This speed is 20 times that of the slow motion films so often seen in picture houses, and 100 times that of an ordinary cinematograph camera. When films taken by this high speed equipment therefore are shown by means of a projector working at normal speed the action appears to be slowed down to a remarkable extent. Films taken with it have revealed the existence of a very brief but well marked interval between the occurrence of a powerful flash of light and the blink of the eyes with which this is greeted, and it has also been used to detect and measure the very short interval between receiving a burn, and the muscular movement that follows it.

One interesting film shows what happens when a marble is dropped in a bowl of milk. When the first splashes appear to have subsided a long column or "spout" is seen to rise slowly to a height of several inches, and this is gradually dispersed in a series of geometrical patterns. These details are not revealed when the occurrence itself is watched with the naked eye, but are readily visible when the film is projected in the usual manner because the action of a single second is made to last more than two minutes.

A special form of the new camera is designed for detecting the winners in races and recording their times. In it the clock is set in operation electrically by the starter's pistol. The competitors are photographed as they reach the tape and examination of the film shows which of them has won, and the time for the race is automatically recorded. The camera has already been used for this purpose and in several instances has detected errors made by the judges. Since it can be made to take photographs directly along the lines of the tape by means of a single lens or eye, its verdict apparently must be regarded as infallible, and its use will help to avoid disputes that may arise after close finishes.



A cinematograph camera that is capable of taking 2,500 pictures a second and recording the time at which each is taken with an accuracy of a thousandth of a second. Photograph by courtesy of Kodak Ltd. and the Western Electric Co. Ltd.

Why Big Men are not always Strong

I was interested to read the other day an explanation of the fact that large muscles do not necessarily mean great strength. Strength depends upon the capacity of a man for taking in oxygen, and the greater this capacity the greater the resistance to fatigue and the ability to form hard work. Large men with big muscles who appear to be sluggish therefore may unjustly be described as lazy when all that is wrong with them may be lack of capacity to absorb oxygen, and to transport it throughout their systems. It is a little disconcerting to find that in this respect a dog is superior to a man, but it can only do more work in proportion to its size because its body is better adapted for the transport of oxygen throughout its system.

These facts have emerged from investigations carried out in America that have shown also the importance of certain kinds of food. Sugars appear to be necessities for those who do hard work of any kind, and this explains the popularity of glucose with long distance cyclists and other sportsmen and athletes, who rely upon it for maintaining their vigour.

New Lamps for Sharp Vision

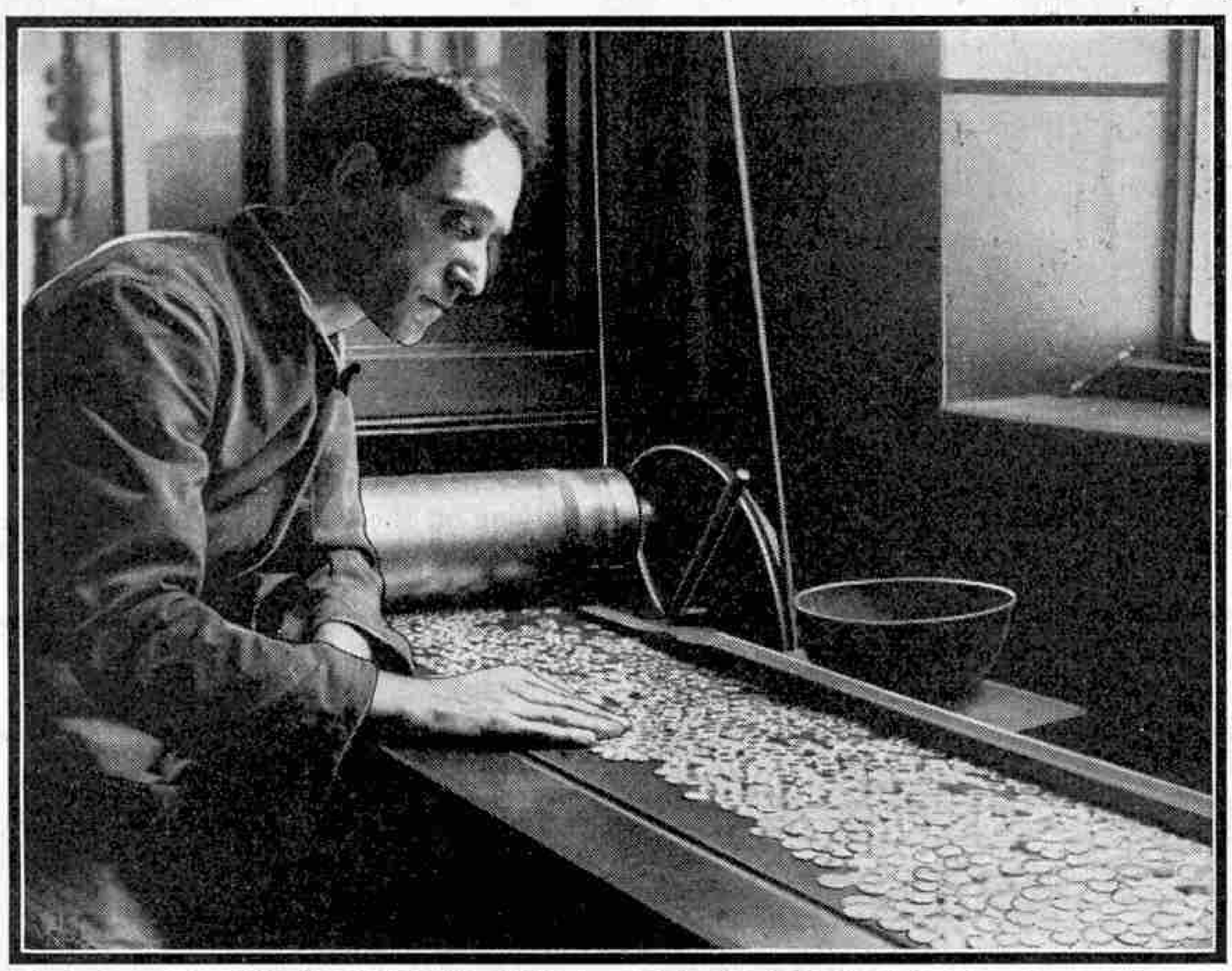
Those of my readers who are fortunate enough to live in districts in which trials are being made of the new sodium lamps for road lighting purposes probably have noticed the sharpness with which objects illuminated by them are outlined. There is an interesting story behind this. We cannot see coloured objects with absolute sharpness even in daylight, for the blue rays from them are brought to a focus a little ahead of the retina of our eyes, and the red rays form their image immediately behind this membrane. Intermediate colours are brought to a focus at points between the two, and the result of this dispersal is slight blurring.

The light from a sodium lamp is not composed of rays of many different colours, however, but almost entirely of rays of only one colour. Confusion due to the spreading out of coloured images therefore is avoided and edges and surfaces are sharply defined. For many purposes sharpness of vision is very important and there will always be uses for sodium lamps, even if for general lighting they are displaced by others giving better colour vision.

Gold and Silver from the Ocean

There are more than a million tons of gold in the oceans, and every ounce of this is now worth about £7. I do not advise any of my readers who are anxious to make fortunes to set about the task of recovering the precious metal from the ocean, however, for it would be necessary to deal with 13,020 tons of sea water in extracting a single ounce of gold! The lure of wealth from the sea has attracted many inventors in the past, and also has been the basis of schemes for extracting money from credulous people.

I am reminded of this by the astonishing success of a great American enterprise. Practically every known chemical element is represented in the sea, and one of these is now being obtained from the ocean by processes carried out in a factory that has been erected near Wilmington in North Carolina. This element is bromine, and it has already been suggested that its production may enable gold also to be extracted profitably from sea water, for while the cost of recovering the precious metal alone may be prohibitive, the processes necessary may pay if bromine and other valuable products can be obtained at the same time. Silver may be one of these products, for it is a thousand times as plentiful in the sea as gold, and the new enterprise, itself a triumph of the industrial chemist, therefore seems to give promise of an entirely new kind of harvest of the oceans.



Viewing new coins at the Royal Mint. The slightest scratch or abrasion is detected as the coins move forward on a travelling belt. An article on "The Machinery of the Royal Mint" appears on page 948.

Playing Tricks with the Calendar

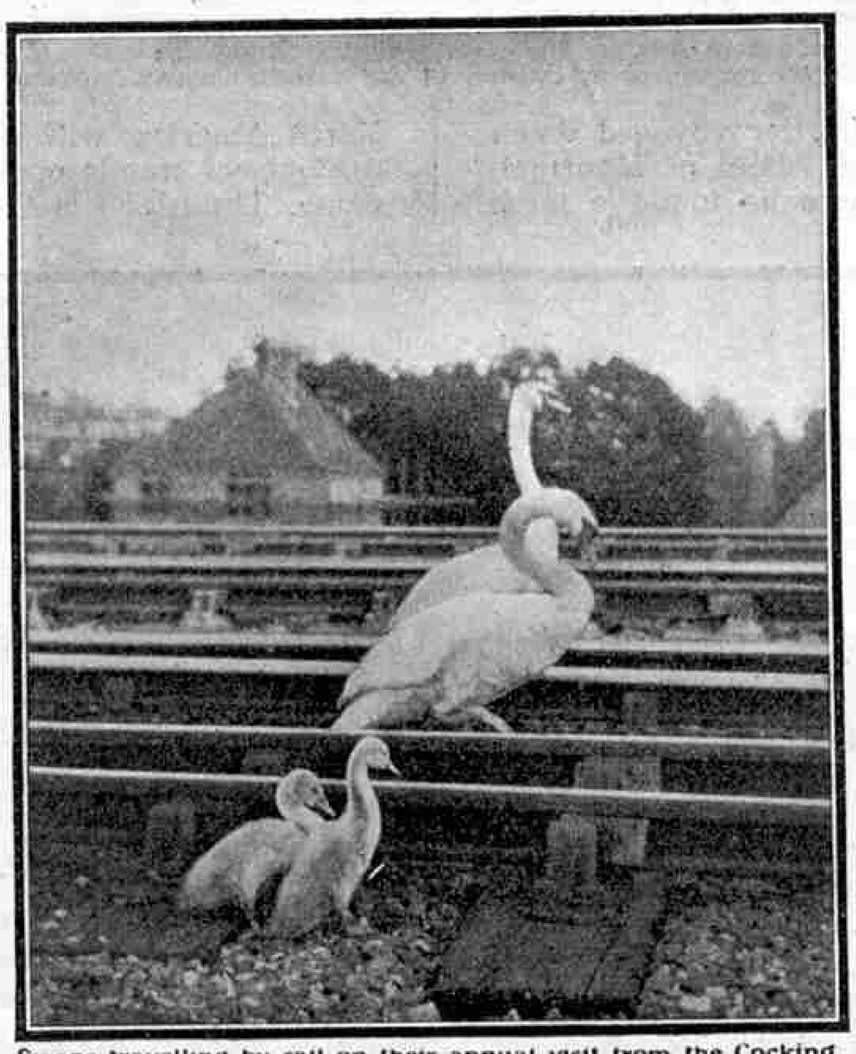
Curious tricks with the calendar are suggested by the result of the MacRobertson Air Race from London to Melbourne, which has shown that aeroplanes capable of flying round the world in a week can be designed. A day must be missed out when travelling round the world in a westerly direction in order to keep the date reckoning correct, and if such a flight were made weekly throughout the whole of the year, the total number of days eliminated would be 52. Those making such a series of flights therefore would have lived only 313 days instead of the normal 365. The necessity for adding a day if the flights were made in the opposite direction would increase the number of days in the year.

Nobody of course would gain or lose by this process, for the year, or the time taken by the Earth to complete its journey round the Sun, would be unaffected. We shall be unable to play tricks with it until we have machines in which we can leave the Earth and travel round the solar system! Our eastward bound travellers would simply find their days shorter, and those who made their weekly flights westward would enjoy longer days, since they would be travelling with the apparent course of the Sun. Each direction has its advantages, but in each case there are compensating disadvantages. Those who go east would be able to enjoy 52 more dinners than usual, but presumably would eat less at each meal. On the other hand passengers travelling westward would eat fewer dinners, but I suppose they would require more generous helpings.

New kinds of watches would be necessary during actual flights of this kind. These would have to show the passage of time and also make corrections for change of position. The watches carried on aeroplanes going east therefore would need to show only 50 minutes to the hour, while those to be used on westward flights would have to indicate hours of 70 minutes. The problem will be simpler for westward flights if aeroplanes capable of about 1,040 m.p.h. are ever designed, for such machines would be able to keep pace with the Sun. The time therefore would not alter and passengers would simply have to stop their watches. A watch running at twice the usual speed would be required for eastward flights in this machine.

A Clock that is Always Wrong

Whatever the future of the aeroplane may bring with it in regard to clocks and watches, there is one clock in the world that almost certainly will continue to show the wrong time, as it is said to have done already for hundreds of years. This clock is in a tower in Görlitz, in Silesia, and is always seven minutes fast. There is nothing wrong with the clock, which is deliberately allowed to show the wrong time as a memorial of an incident in the history of the city. It is said that in 1253 a plot was formed to murder the rulers of the city as they left a meeting. One of the men engaged in the plot changed his mind and prevented the murders by pushing the clock on seven minutes. The result was that the conspirators appeared on the scene too early, their aims were detected and they were arrested. In memory of this escape, and as a record of the strange manner in which it was contrived, the city authorities ordered that the clock should be left to show the wrong time.

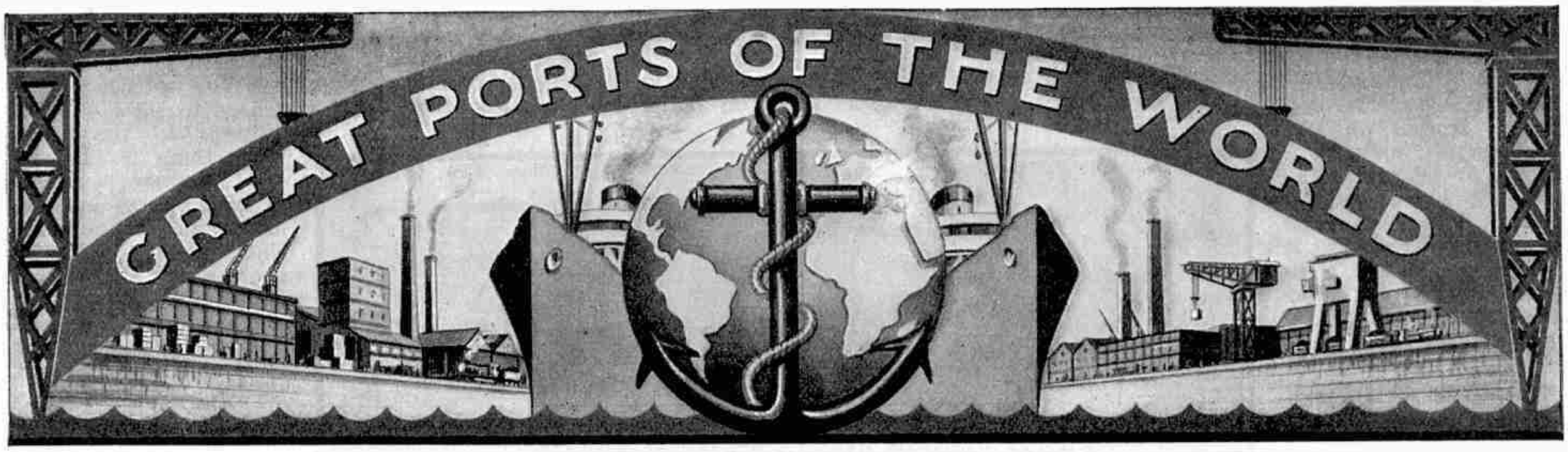


Swans travelling by rail on their annual visit from the Cocking district to Midhurst, on the Southern Railway. Photograph reproduced by permission from the Southern Railway Magazine.

Fish Out of Water

I wonder how many of my readers realise that certain species of fish can live for months without water. This is the case with the lungfish of Australia, tropical Africa and the Amazon region of South America. If the river homes of these creatures become dry they simply curl up in cavities in the mud left in the beds of the streams, and remain there until rainy days return. African fish of this species recently despatched to the London Zoo actually travelled in small blocks of sunbaked clay, in each of which a minute hole was pierced. When the lumps of clay were soaked in warm water on arrival at the Zoo, the fish were released and were no worse for having been deprived of water for about six months.

The lungfish seems to achieve its feat of living without water by using its air bladder. The true purpose of this organ is yet something of a mystery, but it seems to have been developed in an attempt on the part of Nature to produce a new type of creature by endowing certain fishes with the capacity of breathing air directly instead of absorbing the minute proportions of oxygen that are dissolved in water. For some reason the attempt was not successful, and the lungfish of to-day and similar fish of past ages seem to represent one of the experiments in evolution that Nature abandoned.



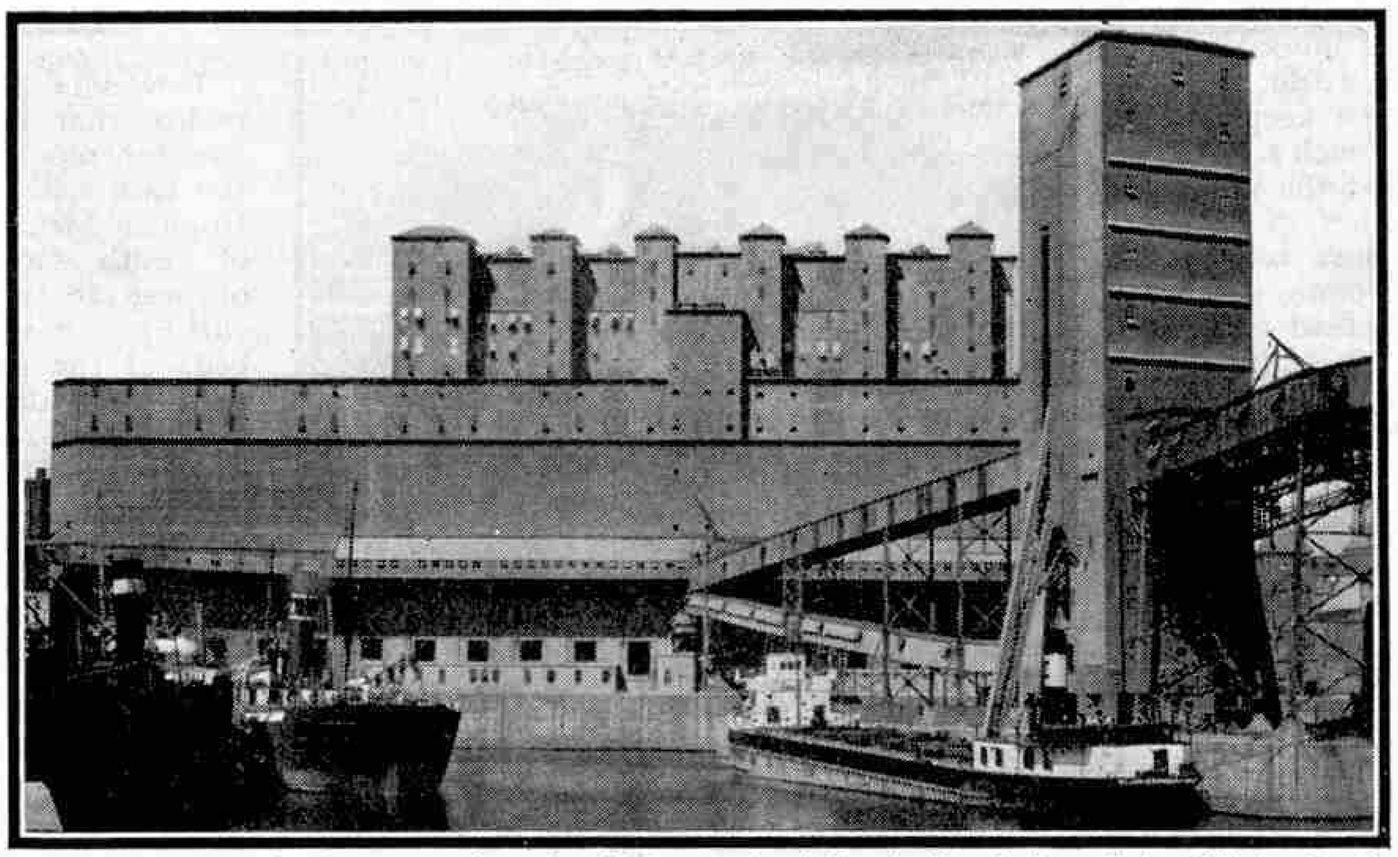
No. XII.—MONTREAL

THE previous articles in this series have described the chief ports of the United Kingdom. We now pass to the Empire overseas, and taking Canada first, we deal this month with the port of Montreal.

The history of Montreal dates back to 1535, when French adventurers led by the navigator Jacques Cartier explored the coasts of Newfoundland and Nova Scotia, and part of the Gulf of St. Lawrence, and took possession of them in the name of Francis I, establishing the first settlement of Europeans in Canada. Cartier voyaged down the St. Lawrence River and landed on the island of Montreal, nearly 1,000 miles from the open sea. There he found a large Indian palisaded town named Hochelaga, and this name is still preserved as the title of an eastern suburb of the modern city that has succeeded Hochelaga. He described the town as being surrounded by fields of grain, and having every evidence of a settled Indian population.

View of the port, taken from the roof of a grain elevator. The Montreal Harbour Bridge can be seen in the background. The illustrations to this article are reproduced by courtesy of the Harbour Commissioners of Montreal.

When another French explorer, Samuel de Champlain, visited the locality 60 years later, he found that the town and its inhabitants had disappeared. He learned from two Indians whom he encountered that a war between rival Indian tribes had resulted in the destruction of the town and the massacre of its people. This enmity between the tribes continued throughout the two-and-a-half centuries that Canada was a province of France, and the early history of Montreal is largely an account of incidents in this warfare. In 1665 a regiment of soldiers under the Marquis de Tracy was sent from France to reinforce the inhabitants of Montreal, and after successfully driving off the Indian assailants they erected forts and provided a garrison to protect the town from further attacks. The security provided by these defence measures greatly benefited Montreal, and it became the centre of the fur trade with the West. The capture of Quebec by the English under General Wolfe in 1759 was soon followed by the surrender of Montreal. Since that time Montreal has steadily developed until it is now the largest city in Canada, and has become the second port in North America, with a world-wide commerce.

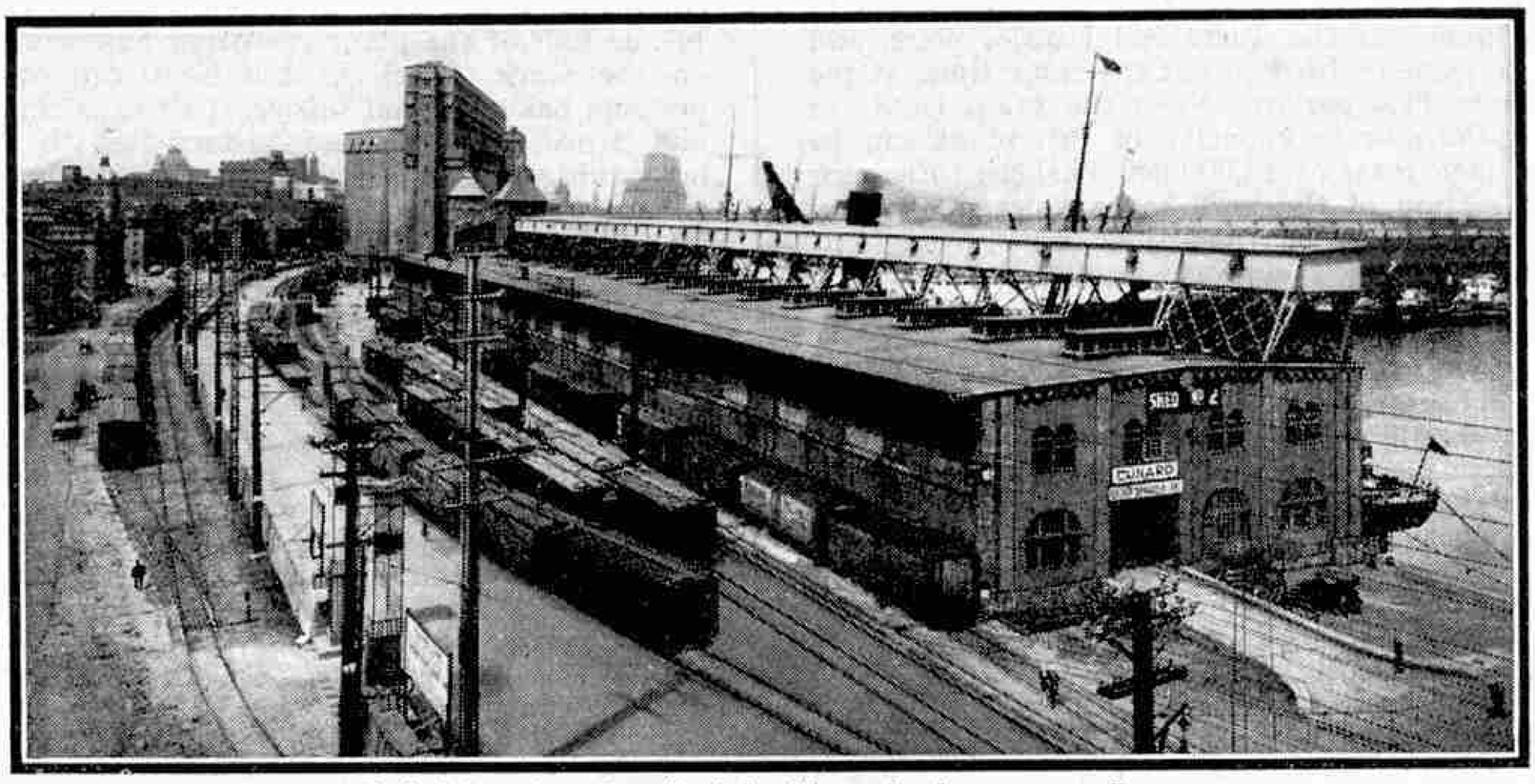


One of the huge grain elevators and, on the right, a mechanical unloading device called a "Marine Leg," that discharges grain-loaded canal vessels.

Montreal stands upon the south-east side of the island of that name. The island is about 16 miles long and 7 to 10 miles wide, and is the largest of a group in the St. Lawence River at the point where this is joined by its important tributary the Ottawa River. In 1850 the navigable channel of the St. Lawrence River at and below Montreal was in places less than 10 ft. deep. The coming of steam navigation and the continued increase in the size of ships made a deeper channel essential if the development of the port was to continue unhindered. The Harbour Commissioners of Montreal, a body appointed by the Canadian Government, began work on an extensive channel improvement scheme, and by 1888 the 70 miles of channel from Montreal to tidal water below Lake St. Peter had been dredged to a depth of 27½ ft. Lake St. Peter is about half way between Montreal and Quebec, and is the farthest point upriver to which the tidal water penetrates, thus the port of Montreal is tideless. In 1888 responsibility for the work was taken over

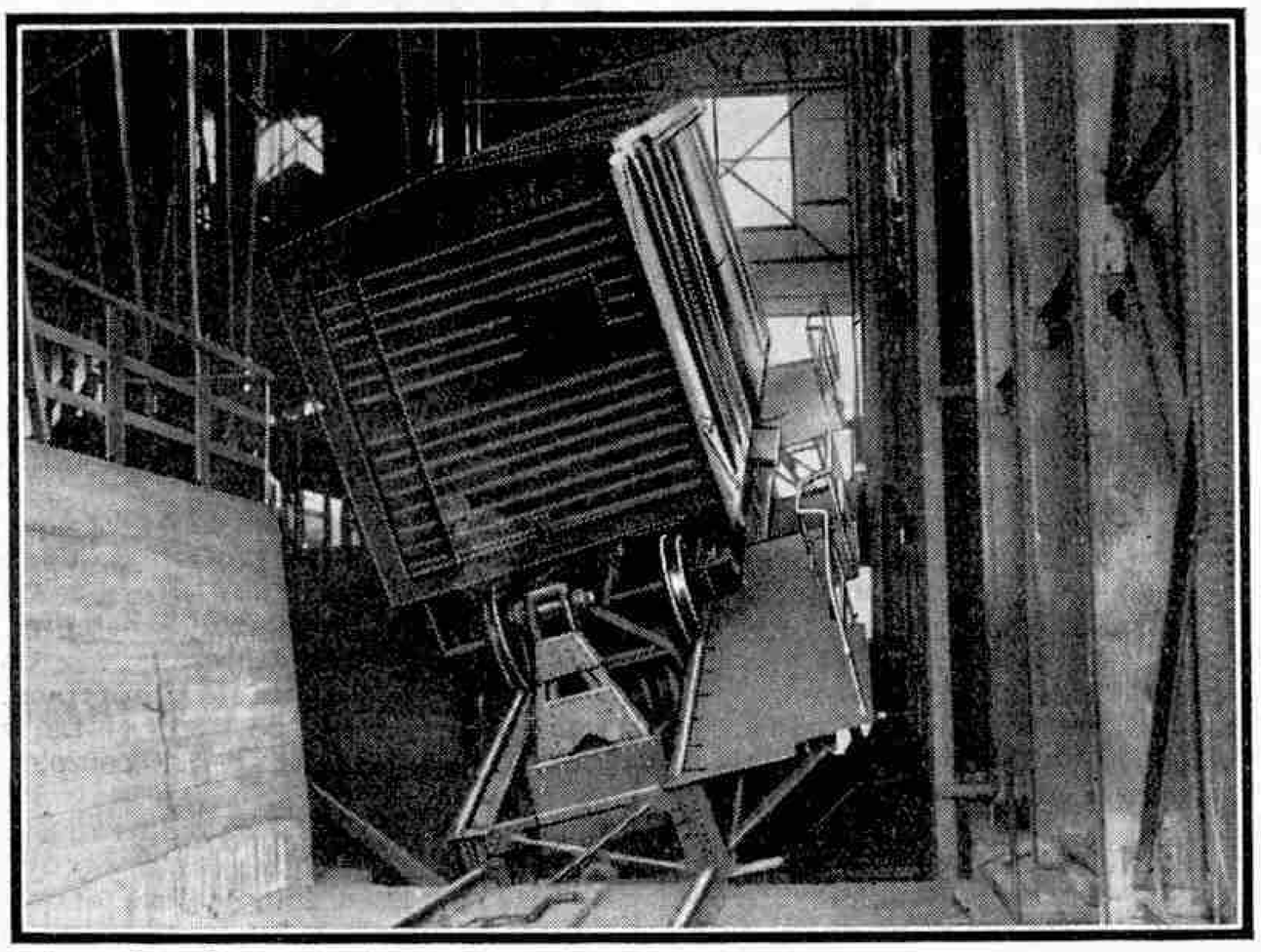
by the Canadian Government who have continued the dredging operations. The navigable channel of the river now has a minimum depth of 30 ft., and a minimum width of 450 ft.

The development and organisation of the port, apart from the maintenance of the river channel, remained the responsibility of the Commissioners, who extended the docks equipment from time to time to cope with increasing trade, particularly the grain traffic. The first grain elevator at Montreal was built in 1904. In time the continued growth of the grain traffic made more storage accommodation necessary, and in 1912 the elevator was enlarged and another, known as No. 2, was constructed. These improved facilities eventually became insufficient, and in 1915 No. 1 elevator was further enlarged, and in 1923 a third one was built. In addition, elevator "B" at Windmill Point basin, operated by the Montreal Warehousing Company, was taken over by the Commissioners and enlarged, so as to bring all the grain handling plant of the port under their control.



Typical two-storey transit shed with overhead conveyor-gallery.

The development of the port has not been confined to accommodating the grain traffic, however, but has included the provision of extensive wharves and piers, commodious transit sheds, an immense cold storage warehouse, and coaling plants. The earliest wharves and piers consisted of timber framework filled in with stone rubble, but these have been replaced by modern concrete structures. The quayage totals 53,335 ft., of which 36,308 ft. are available for ships up to 650 ft. long with a draught of 30 ft. at ordinary low water. There are 20 two-storey and six single-storey transit sheds, with a total length of 12,000 ft. and capable of handling in all 300,000 tons of cargo per week. The sheds are of steel, with concrete floors and roofs, and are about 100 ft. wide. Electrically-driven hoists give access to the upper floors of the two-storey sheds, and each hoist can lift two loaded carts or motor lorries at a time, with a total weight of 20 tons. Eighteen of these sheds are situated on high-level piers in the central section of the port, and are equipped with overhead conveyor galleries by which grain can be delivered from either No. 1 or No. 2 elevator simultaneously with the loading or unloading of general cargo.


One of the mechanical unloaders that discharge grain brought to the port by rail.

For handling ordinary package freight from ship to shore and vice versa, the ship's cargo-handling tackle is usually employed, but to supplement this, and for situations where such a method cannot be used, the Commissioners possess a fleet of floating cranes ranging in capacity from 5 to 15 tons, and eight locomotive cranes of 10 to 30 tons lifting capacity. A large floating crane with a lifting capacity of 75 tons at 54 ft. radius is used for handling heavy freight such as locomotives, boilers, machinery, etc. It is 200 ft. long and 43 ft. wide, and has a lift above water of 100 ft.

Every shed and berth in the port, and every adjacent industry, is served by the Commissioners' electric railway system, called the Harbour Terminal Railroad. It was established in 1907 and has 70 miles of track, and connects with the lines of the Canadian National and Canadian Pacific railways, which converge at Montreal. In the first year of operation the Commissioners' railway dealt with 70,000 wagons, and with the growth of the trade of the port it now handles about 200,000 wagons per working season, or 1,000 wagons per day.

The Lachine Rapids just above Montreal prevent ocean shipping from proceeding higher up the St. Lawrence River, and Montreal owes its importance as a port to the facts that it is thus the terminus of ocean navigation, and is also the starting point of an extensive system of Canadian canals. These canals, by connecting with the Great Lakes, make possible the navigation of 1,600 miles of inland waterways to Chicago, Fort William, Duluth, and other important towns in the heart of the North American Continent. The entrance to the first of these canals, called the Lachine Canal, is in the western part of the port, and is equipped with locks capable of taking ships 225 ft. long, 42 ft. broad, and of 14 ft. draught.

The trade of the port is restricted to eight months of the year, as from about the middle of December to the middle of April the St. Lawrence River is blocked by ice. In spite of this great handicap the volume of trade done during the period that the river is open reaches an impressive figure. In 1933 the imports and exports totalled 10,565,408 tons, and 1,476 ocean ships visited the port.

Montreal is the premier grain-exporting seaport in the world, and every year millions of bushels of grain are brought there from the vast western provinces of Canada by canal, river and railway, for shipment to Europe. At Montreal the grain is stored in huge elevators, and that arriving by rail is discharged into them by mechanical unloaders that simultaneously raise and tilt the wagons, and empty them, at the rate of seven 2,000 bushel wagons per hour. There are two of these machines in No. 1 elevator, four in No. 2, four in No. 3 and one in elevator "B."

The grain brought to the port by canal vessels is unloaded by means of devices called "marine legs," of which there are four at No. 3 elevator and two at each of the other three elevators. A marine leg consists of a movable metal sheath or leg containing a vertical rubber belt that passes around a pulley and is fitted with metal buckets spaced 18 in. apart. This leg is lowered into the hold of the canal vessel. The unloading capacity of these legs ranges from 15,000 to 20,000 bushels per hr.

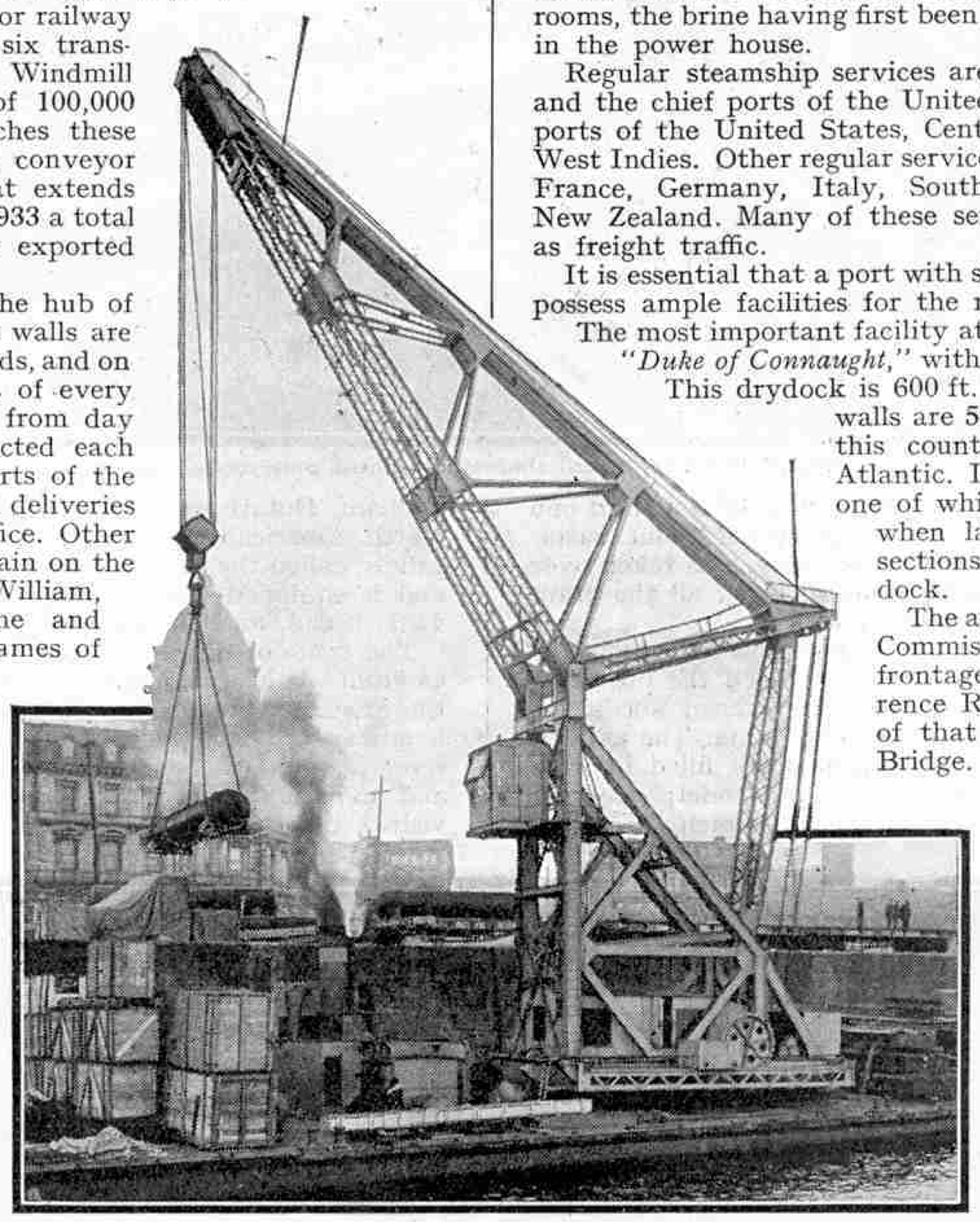
No. 1 elevator has a storage capacity of 4,000,000 bushels. It can receive grain from Lake vessels and barges at the rate of 40,000 bushels per hr., and from railway wagons as just described. Grain can be delivered at the same time to ocean ships at the high rate of 75,000 bushels per hr. No. 2 elevator is smaller and can store only 2,662,000 bushels. It is connected to No. 1 elevator by overhead conveyor galleries approximately 11,670 ft.

long, and by the same means can deliver grain to all of the 20 steamship berths in the central section of the port, at the total rate of 150,000 bushels per hr.

The elevator known as "No. 3" is the largest of the four plants and can accommodate 5,000,000 bushels. It is 640 ft. long, 80 ft. wide and 200 ft. high. The elevator is in the eastern section of the port, and is equipped with eight overhead conveyor galleries, totalling 3,290 ft. These galleries extend to five shipping berths at two of the piers, known as the Tarte and Laurier piers, and enable five ships to be loaded with grain at the same time, at the total rate of 120,000 bushels per hr. When the grain traffic of the port warrants it the storage capacity of this plant can be increased up to the huge total of 12,000,000 bushels. Elevator "B" in the western section of the port has a storage capacity of 3,500,000 bushels. At the same time that it receives grain from Lake vessels or railway wagons it can deliver grain to six trans-Atlantic ships berthed at the Windmill Point wharf, at a total rate of 100,000 bushels per hr. The grain reaches these ships by way of an overhead conveyor gallery about 2,270 ft. long that extends the full length of the wharf. In 1933 a total of 1,608,517 tons of wheat was exported from Montreal.

The Grain Records Office is the hub of the grain traffic at the port. Its walls are almost covered by huge blackboards, and on each board is shown the stocks of every grade of grain in the elevators from day to day, the figures being corrected each morning after the elevator reports of the previous 24 hours' receipts and deliveries have been handed in to the office. Other boards show the quantities of grain on the way to Toronto from Fort William, Duluth, Buffalo, Port Colborne and Georgian Bay ports, with the names of the carrying vessels, quantities on board, etc.; the amount of grain on its way to the port by rail; orders received for ships awaiting in the harbour; and the names of ships chartered to load grain at Montreal. Toward the close of each season of navigation, when hopes of eclipsing the previous year's record are high, the columns headed "Total to Date" become of great interest.

Montreal is one of the most important flour milling centres in Canada, and the wheat to supply the Montreal mills is carried by canal from Fort William. A considerable quantity of flour is exported, the total for 1933 being 262,499 tons.



The Harbour Commissioners' 75-ton floating crane handling heavy freight.

Montreal is much more than merely a great grain port, however, and in 1933 no less than 8,903,780 tons of commodities other than grain passed through the port. On the import side, crude oil and gasoline headed the list with a total of 1,822,342 tons, an increase of 250,475 tons over the previous year, and constituted a record for the port. Oil refineries owned by private companies are situated at the eastern end of the harbour. The import of British anthracite coals has become a very important branch of the trade of the port and in 1933 amounted to 1,306,646 tons. Most of the ships that bring in coal depart with cargoes of grain. Rapid unloading is important, therefore, and many coal-unloading installations are provided, the largest of which has an unloading capacity of 18,000 tons per 10-hr. day. The cranes travel on a trestle that extends along the front of the pier or wharf, and their hinged booms are lowered to project horizontally over the ships. Along each boom runs a hoisting trolley carrying a self-loading grab bucket of three tons capacity.

The general merchandise exported from Montreal includes a great variety of foodstuffs, of which the chief are lard, fruit and cheese. Other important items are meat, cereals and butter. Perishable commodities are accommodated in a modern 10-storey warehouse that has a storage capacity of 4,628,000 cu. ft. and is centrally situated in regard to the port, city and the railway termini. Ten refrigerator vans can be loaded or unloaded from a track adjoining one of the loading platforms in the warehouse, and another 10 can be dealt with from a track just outside the building. A total of 30 motor or horse-drawn lorries can be accommodated at the loading platforms inside the warehouse. Interesting features of the equipment are an air conditioning plant for use in each of the cold rooms, and an artesian well, bored to a depth of 1,100 ft., that provides water of excellent quality and of the low temperature of 42 deg. in summer.

The power house, in which is also housed the refrigeration machinery, adjoins the warehouse. All important machinery, compressors, etc., are in duplicate, so that in case of accident to one half of the plant the other half will be sufficient to carry on the work. Each of the electrically-driven ammonia compressors has a normal refrigerating capacity of 150 tons per day, and if necessary this can be increased to 200 tons per day. An ice-making machine is also a feature of the equipment. The cold storage floors of the warehouse are refrigerated by the circulation of calcium chloride brine through piping coils in the various rooms, the brine having first been cooled to a very low temperature in the power house.

Regular steamship services are maintained between Montreal and the chief ports of the United Kingdom, Atlantic and Pacific ports of the United States, Central and South America and the West Indies. Other regular services link up Montreal with Holland, France, Germany, Italy, South Africa, India, Australia and New Zealand. Many of these services include passenger as well as freight traffic.

It is essential that a port with such world-wide commerce should possess ample facilities for the repair and overhaul of shipping. The most important facility at Montreal is the floating drydock *"Duke of Connaught,"* with a lifting capacity of 25,000 tons. This drydock is 600 ft. long, 135 ft. wide, and the side walls are 59 ft. high. The dock was built in this country and was towed across the Atlantic. It is built in two sections, either one of which may be used separately, but when larger ships require docking the sections are combined into one floating dock.

The administrative area of the Harbour Commission covers 16 miles of water frontage on each shore of the St. Lawrence River. Within the central portion of that area is the Montreal Harbour Bridge. Prior to the building of this structure the only means of cross-river communication for road and rail traffic was the Victoria Tubular Bridge, the name given to the Royal Victoria Bridge when it was reconstructed and widened in 1897. Increased traffic soon outgrew the capacity of the enlarged bridge, however, and for many years there was a great demand for a second structure. In 1922 the urgent need of improved trans-river facilities was placed before the Canadian Government, with the result that the Minister of Marine requested the Harbour Commission to make surveys, soundings and borings in order that preliminary designs and plans for a second bridge might be prepared. This work was carried out by the Engineering Department of the Commission. A report was then submitted to the Minister of Marine, and by him to the Government, who authorised the Commission to design and erect a bridge, subject to their approval. During 1925 contracts were given for various portions of the work and the building of the bridge was begun. It was completed five years later, and was formerly opened on 24th May 1930 by the Rt. Hon. W. L. Mackenzie King, then Premier of Canada.

The bridge is of the cantilever type and is 11,236 ft. or 2⅛ miles long. The governing feature of it is the main cantilever span, 1,097 ft. long from centre to centre of the piers over the navigation channel in St. Mary's Current, where the flow is from five to seven miles per hr. The docks of the transatlantic liners, and the principal activities of the harbour are situated above the bridge, and the central 500 ft. of the main span gives a clearance of 163 ft., which is enough to allow the largest ships to pass. The north anchor arm spans the railway tracks of the harbour and of the Canadian Pacific Railway, high tension power lines, a large building and a busy street. The structure provides a wide roadway, and carries two electric tramway tracks and two sidewalks. The construction of this fine bridge was fully described and illustrated in the *"M.M."* of January 1931.

We are indebted to the Harbour Commissioners of Montreal for much of the information contained in this article.

Puzzle Your Sharp-Eyed Friends

Simple Conjuring Tricks for Christmas

By Norman Hunter (From Maskelyne's Mysteries)

BEFORE I start to describe the actual tricks, I should like to emphasise one or two important points.

Every conjuring trick, no matter how easy, needs to be tried over a few times in private before being shown to an audience; and every trick needs to be presented in an entertaining fashion. These two points are really dependent on one another. I have included in the descriptions a few suggestions for the sort of remarks you should make while presenting each trick.

Now for the first item.

TAKE YOUR CHOICE

The conjurer brings forward a bottle of wine from which, if he likes, he can pour out a glassful. "Some people like a glass of wine," he says, "while others prefer something different. The best of being a magician is that you can cater for all tastes."

He puts the bottle into a round-shaped case, which he first shows empty. When he opens the case again, the bottle of wine has disappeared and the case is filled with sweets, which he pours on to a plate and hands round. The case is then shown to be empty.

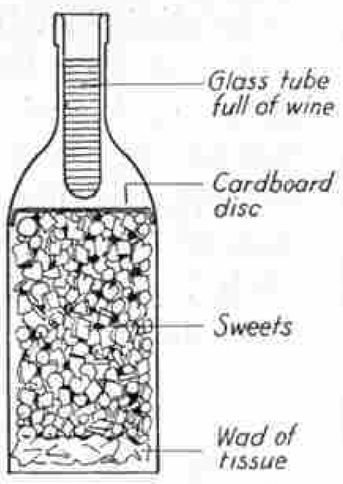


FIG. 1

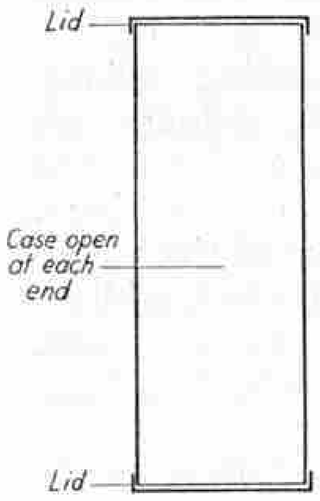


FIG. 2

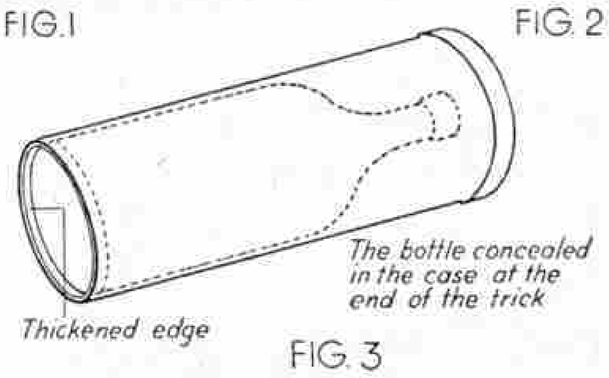


FIG. 3

The Secret. The bottle is a dummy made of cardboard. You can buy bottles of this kind filled with crackers at most fancy stores; they are sold in various shapes and sizes, so you can choose one that best suits your own purpose. Take out the centre container that holds the crackers and throw it away. Now glue into the bottle, right up near the neck, a disc of cardboard to form a sort of false bottom (Fig. 1). Into the neck of the bottle fit a glass test tube. The wine that is poured out of the bottle at the beginning of the trick is contained in this tube. You may omit this part, if you wish, but the pouring of liquid from the bottle will go a long way towards convincing your audience that the bottle is genuine.

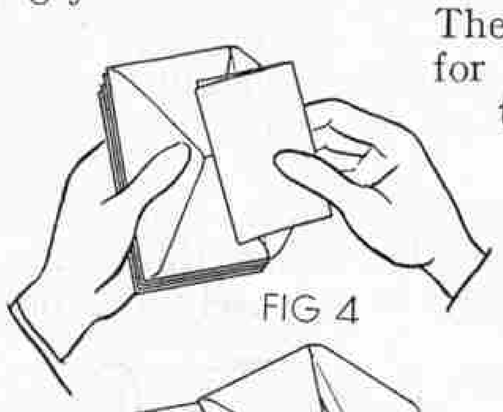


FIG. 4

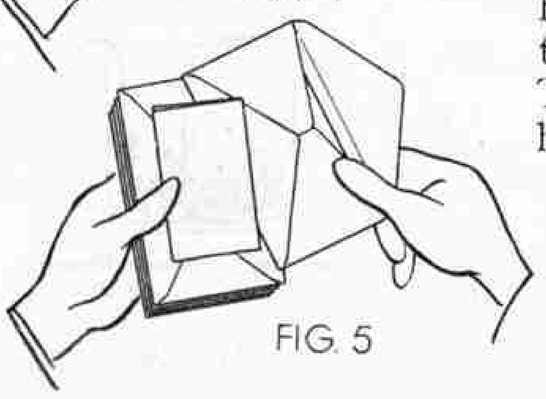


FIG. 5

The next thing is to make a case for the bottle. Take a sheet of thinnish cardboard and roll it round the bottle. Fasten the cardboard with glue, or with push-through paper fasteners, and you now have a tube into which the bottle will fit snugly. Trim the tube to the same height as the bottle and then make two small lids for the ends (Fig. 2). Cover the tube and the lids with fancy paper, or paint them, remembering that the case should look the same whichever way up it stands.

To prepare for the trick, fill the bottle with sweets and stuff a little wad of tissue paper in last, to keep the sweets from falling out when the bottle is stood up. Have the case on your table with one lid fitted on to do duty as a bottom. Show the bottle, pour out the liquid, and drop the bottle into the case after allowing your audience to see that the case is empty. Now put on the lid, and as you do this, tilt the case so that you are holding it in a horizontal position with one hand on each end.

While you remark that being a magician enables you to give people their choice of drinks or other things, turn up the case and stand it on the table, but turn it the reverse way from what it was originally, so that the bottom of the dummy bottle is now at the top. Take off the top lid, remove the wad of paper, and pour out the sweets. The inside of the bottle will look sufficiently like the inside of the case to give the impression that the case is empty, as long as you do not permit the spectators to look into it for any length of time.

One little point may be mentioned. It will be well to paste some thicknesses of paper round the edge of the tube, on the inside, at the end where the bottom of the bottle will come. This little ledge will then hide the edge of the hollow bottle.

The trick should be presented briskly, and it is a very suitable one for the first item in a programme.

Now for a quite surprising trick that will get the knowing ones guessing.

THE MAGIC PENCIL

"This is a magic pencil," says the conjurer. "Perhaps someone would like to look at it." He hands round a pencil for examination, which does not reveal anything beyond the fact that it is just an ordinary black lead pencil.

"It is a magic pencil all the same," says the conjurer, taking back the pencil. "Look, it writes in colour." He proceeds to write on a piece of paper the words "red," "yellow," "green," and so on; but as he only writes the names of the colours, and they all come out plain black, the audience probably will let him see that they do not think much of that for a trick.

"Of course," continues the wizard, "you cannot appreciate my magic pencil until its writing has had time to develop." He folds the paper and seals it in an envelope, which he proceeds to warm over the flame of a candle. Then he slits open the envelope and unfolds the paper, and the audience see that the name of each

colour is now written in its proper colour. Pencil, paper and envelope may all be examined.

The Secret. For this trick you need a packet of envelopes, two sheets of paper exactly alike, and an ordinary black lead pencil. To prepare the experiment, take one of the sheets of paper and with a red crayon write the word "red" near the top. Under that write the word "yellow" with a yellow crayon, and continue writing the names of as many colours as you wish, using for each one the crayon of the corresponding colour. Six colours are enough, and you must memorise the order in which you have written them. Now fold the paper and place it inside one of the envelopes. Hold the rest of the envelopes in a packet, address sides down, and lay the envelope containing the paper, address side down, on top of them. Lay the envelopes in this condition on the table.

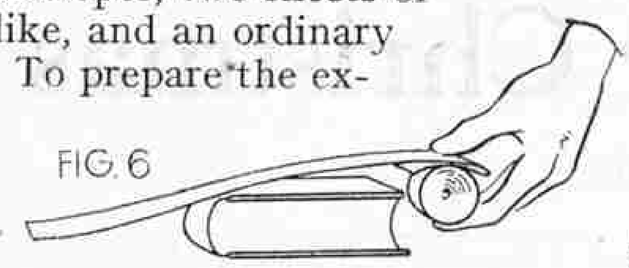


FIG. 6

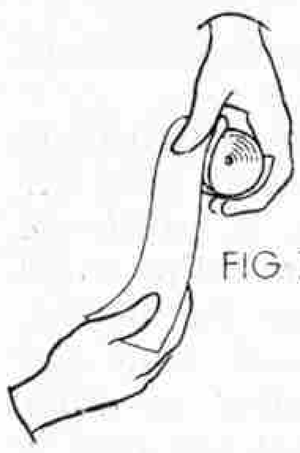


FIG. 7

FIG. 8

The performance of the trick is plain sailing up to the point when you fold the paper on which you have openly written the names of the colours in black. Now pick up the envelopes, and apparently insert the folded paper into the top one. Actually you open the flap and slide the folded paper on top of the envelope, as shown in Fig. 4. Now draw off the envelope, holding back the folded paper with the thumb of the hand that holds the packet of envelopes (Fig. 5). Turn the packet of envelopes over and put it down. This brings the folded paper with the black writing underneath, and comfortably out of sight. All you now have to do is to seal the envelope—which of course already contains the paper with the coloured writing—and conclude the trick as I have described.

THE FROZEN LIMIT

The conjurer shows a piece of paper on both sides and rolls it into a tube.

"Everybody knows," he says, "that blowing on things tends to cool them. Some people, for instance, blow on their tea to cool it, but of course really well-bred people never do that, they fan it with the saucer! As I am a magician, my blow is a lot frostier than most people's. Look! I'll blow into this paper tube, and then you see what happens when I pour in some water."

He blows into the paper tube and then pours a wineglassful of water into the tube. The water drops out of the bottom of the tube in the form of a solid lump of ice and the paper is unrolled and shown to be empty.

The Secret. I know I said the water falls out in the form of a solid lump of ice, but that was a sort of a fib, really. The solid lump is glass, not ice, but the audience get no chance to detect the difference as the lump is quickly put aside. Actually the so-called ice is a clear glass inkwell of the unspillable type. At the beginning of the trick the inkwell, empty of course, lies on its side behind a book. On top of the book is a piece of stiff paper measuring about 8 in. by 12 in. Two or three inches of it are folded down, across the narrower way of the paper, and in this condition the paper is rolled into a tube, the folded down portion being inside. Now let the paper unroll and lay it over the book, folded down part underneath and to the back.

When you pick up the paper do so with your thumb on top and fingers behind. You will then be able to pick up the inkwell against the back of the paper (Fig. 6).

Now hold the paper as shown in Fig. 7 with the inkwell behind the fold. To show the other side of the paper, raise the lower edge of the sheet and lift it right up, opening the fold out as shown in Fig. 8. You are now showing a slightly larger sheet than before owing to the fold having been opened, but this will not be noticed. Fold the paper down again and roll it up with the inkwell inside. Retain the inkwell in the tube by squeezing the tube slightly with the fingers, and turn the tube up on end. All you now have to do is to pour the water in at the right end and allow the inkwell to drop out. As your patter or story has prepared the audience to some extent and led them to expect a lump of ice, they will accept the inkwell as ice; but in any case you instantly pick it up and drop it into a bowl out of sight while you unroll the paper.

SORTING IT OUT

For this the wizard has a box full of confetti. He shows a glass jam jar and fills it with confetti, then he covers the jar with a paper tube.

"In the ordinary way it would take no end of a time to sort out the colours of that confetti," he remarks, "but wizards can be very sudden when they like. Look at this." He lifts the tube, and the audience see that the confetti is now separated into layers, each layer being of one colour; and the conjurer pours the separated confetti out on to saucers to show that it really is separated.

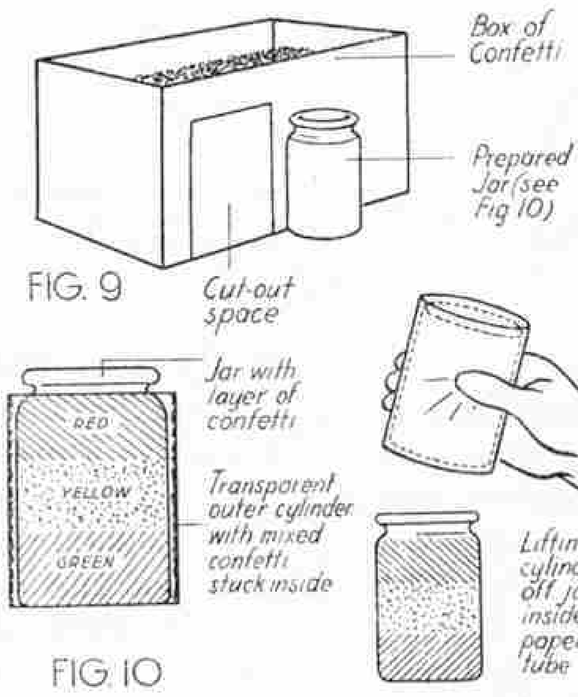


FIG. 9

FIG. 10

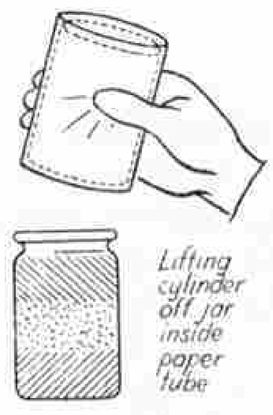


FIG. 11

The Secret. I suggest that you use confetti made up of only three colours, to simplify the trick. That means you will have to make your own confetti, but that is easy enough. Fold up some crepe paper and cut it into small pieces with scissors. The pieces can be of any shape, and they need not be anything like so small as confetti usually is. Make a good heap of confetti of each colour and keep apart some of each colour before you mix the rest.

The box in which you have the mixed confetti is prepared by having a piece cut out of the back large enough for the jam jar to be pushed through, but the box is deep enough to prevent this cut-out space from being seen from the front (Fig. 9).

You will need two jam jars, both alike, and also a cylinder of cellophane or celluloid or other thin transparent material, just large enough to fit loosely over one

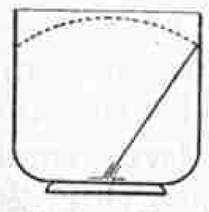


FIG 12

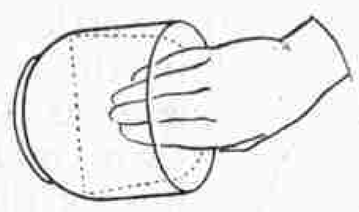


FIG 13

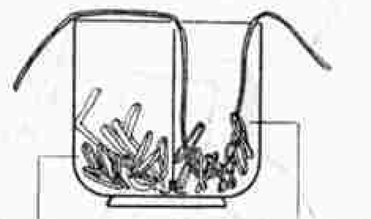


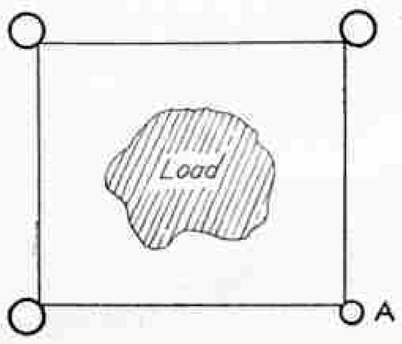
FIG 14

of the jars. To the inside of this cylinder stick some of your mixed confetti by spreading gum on the inside of the cylinder and filling it with confetti. When the gum is dry you can shake out the loose confetti and the cylinder is ready for use.

To set the trick, place the box of confetti on your table with the cut-out part to the rear. Behind it stand one of the jars (Fig. 9). This jar is filled with confetti of three separate colours, in layers. The prepared cylinder is then dropped over the jar and gives it the appearance of being full of mixed confetti (Fig. 10).

In showing the trick, show the other jar and fill it, a handful at a time, with confetti from the box. Apparently stand the jar behind the box and take the box away. What you really do is to push the jar through the open space into the box, then rest the hand that held the jar on the duplicate jar while you take away the box with the other hand.

Cover the now visible jar with a paper tube and, as you remove the tube, grip it firmly and so carry away the fake cylinder with it (Fig. 11). Allow the cylinder to drop into the box of confetti, and you can show the paper tube empty. Then empty out the separated confetti.



Cloth with ring
FIG. 15

Small ring passed through large ones -load inside
FIG. 16

FIG. 17

Another way of changing the jars is to use an unprepared box and have the prepared jar standing in one of the front corners. Fill the visible jar by dipping it into the box and scooping confetti into it with the other hand. Lift the jar and pour the confetti back into the box. Again fill the jar, but leave it in the box this time, and bring up the duplicate prepared jar, then proceed as for the other method.

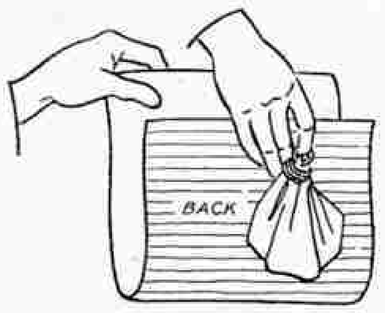


FIG. 18

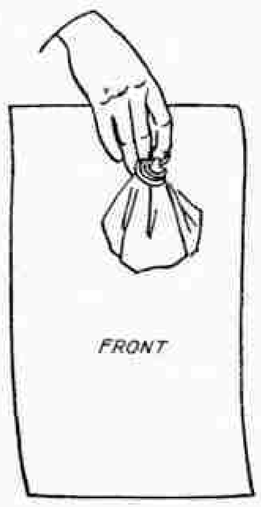


FIG. 19

FIG. 20

HOOP LA

A quick and effective trick. The conjurer shows a bowl empty and drops a length of tape into it, leaving the ends of the tape hanging over the edge of the bowl. He then drops half-a-dozen rubber rings, such as are used for parlour games, into the bowl, and immediately takes out the tape with the rings threaded on it. Or better still, he invites two members of the audience to hold the ends of the tape and, as he pours the rings into the bowl, they pull the ends of the tape, and the rings come out threaded on the tape. The bowl is empty.

The Secret. Two pieces of tape and two sets of rings are used. The bowl is divided by a partition hinged to the bottom with strips of cloth so that it can be moved from side to side. The bowl is of the deep variety (Fig. 12).

At the beginning of the trick one set of rings already threaded on a piece of tape rest in the bowl, and the partition is moved over to cover them. Pick up the bowl by the edge, gripping the edge of the partition as well. Show it empty with a sweeping movement (Fig. 13). As long as the partition and the inside of the bowl are painted black, the bowl will appear to be empty. Take the visible piece of tape, loop it up and drop it into the empty side of the bowl. Move the partition half-way across, and drape the ends of the hidden tape over the sides (Fig. 14). If you use long pieces of tape you can give the ends to two members of the audience to hold.

Now drop in the rings, swing the partition the rest of the way over, and pick up the bowl as before, gripping the partition over the loose rings and tape. The tape and threaded rings can now be drawn out and the bowl shown empty as before. Rubber rings are advisable because they will not rattle and give away the fact that there is another set of rings in the bowl.

Now for a good showy finishing trick.

THE MAGIC CARPET

A small carpet is shown on both sides and the ends are held together, making the carpet into a sort of bag. Immediately from the folded carpet yards of silk and ribbons are produced, followed by showers of jewels.

The Secret. You can produce almost anything you like from this carpet, but silks and jewels (strings of beads) are the most suitable. The carpet is unprepared, and is simply a small rug of oriental design. It need not be the genuine article, in fact you can make a very effective one from a piece of purple velvet sewn to a similar sized piece of stiff canvas. Stencil an oriental design on to the velvet with oil paint, used rather thick, and sew fringe to the edges of the rug.

The load to be produced is contained in a bag of black material. This bag is actually a square of stuff with a ring sewn to each corner (Fig. 15). Three of the rings are fairly large, but the fourth (A) is smaller so that it will pass easily through the others. Pack your load into a small pile on the centre of the cloth. Gather up the corners of the cloth and pass the small ring A through the three large ones (Fig. 16). You can now hold the load by the small ring and it will be quite secure, yet as soon as you release the small ring it will pass through the other rings and allow the bag to open and the load to escape.

Bring the carpet forward held by one end with the load held behind it (Fig. 17). With the opposite hand take hold of the lower edge of the carpet and bring it up in front of the carpet. As soon as this lower edge has passed in front of the top edge of the carpet, let go of the top of the carpet with the hand that is holding the load. The top of the carpet will now fall, thus exposing the back. Take the edge that is now at the top in the hand that holds the load, and you are in the same position as at first, only the back of the carpet is showing (Figs. 18 and 19). Repeat the moves to bring the front of the carpet to face the audience. The load will have remained out of sight all the time.

Now take the bottom edge of the carpet and bring it up behind the carpet, instead of in front of it. Grip the two edges together, thus forming a sort of bag with the load inside. Let go of the load and it will open out with a little shaking, so that the contents can be drawn out of the folded carpet (Fig. 20).

If you like you can make the bag for the load of some fancy material. It can then be shaken out with the other articles, leaving you free to show the carpet empty again at the finish.

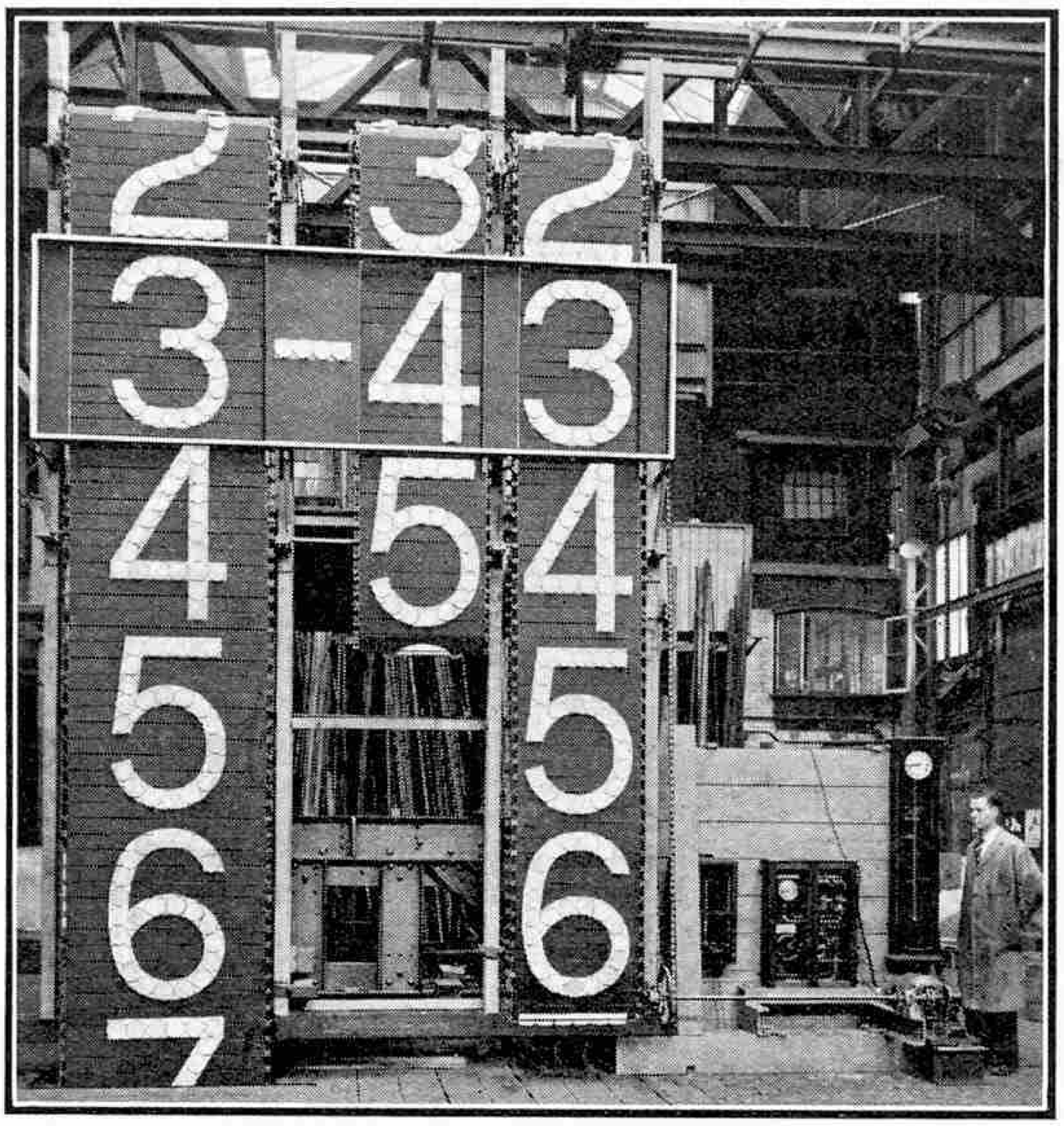
A Timekeeper Without a Dial

World's Largest Moving Figure Clock

By T. R. Robinson

THE usual form of clock dial is one of the most familiar objects in the world, and we have become so accustomed to reading the time from it that it is easy to overlook the fact that the passage of the hours and minutes can be indicated in other ways. The novel electrically-driven timekeeper erected in Paddington Station, London, shows that this can be done with an efficiency at least equal to that of the ordinary dial. It shows the time in hours and minutes by displaying a series of figures in an oblong frame fixed high up on the station wall. Three figures appear in the frame, that on the left marking the hours, and the remaining pair showing the minutes. Changes are made at the correct intervals by the action of relay switches controlled by an electric master clock, and at any moment the figures give a time indication in the same form as that employed in railway timetables. Thus the clock gives the time in the manner that is most useful to travellers.

The clock at Paddington is claimed to be the largest in the world to have moving figures, and is built on a gigantic scale. Its indications are easily read, for the figures are 3 ft. in height, and have been designed to enable them to be distinguished readily. In addition, they are fitted with silvered glass reflectors that are brilliantly illuminated at night by means of floodlamps.



The world's largest moving figure clock under test in the works of Gillett and Johnston Ltd., Croydon, to whom we are indebted for the photographs illustrating this article. The figures in the rectangular frame indicate the time in hours and minutes, and are the only visible features of the clock as installed at Paddington Station.

An ingenious form of construction has been employed in the clock. Each set of figures is arranged on an endless band, resembling a roller shutter, made up of horizontal strips of steel jointed together at their corners by means of flexible links. There are of course three bands, each of which is 37 ft. in length, and their total weight is about three-quarters of a ton. Although they are so heavy, each change of figures occupies only about eight seconds owing to the efficiency of the driving mechanism employed. In this the flexible links forming the joints engage with the driving sprockets and thus act in the same manner as do the perforations in a cinematograph film, which engage with the sprockets of the projector.

The driving sprockets are located at the upper ends of the figure bands, and serve also to support them, the weight of the bands ensuring that the links follow the slots in the sprockets correctly. The lower ends of the bands are passed round simple idler rollers that assist in maintaining smooth movement during figure changes. Ball bearings are fitted at all possible points, and grease gun nipples are placed in positions that ensure complete lubrication of every bearing with a minimum of trouble.

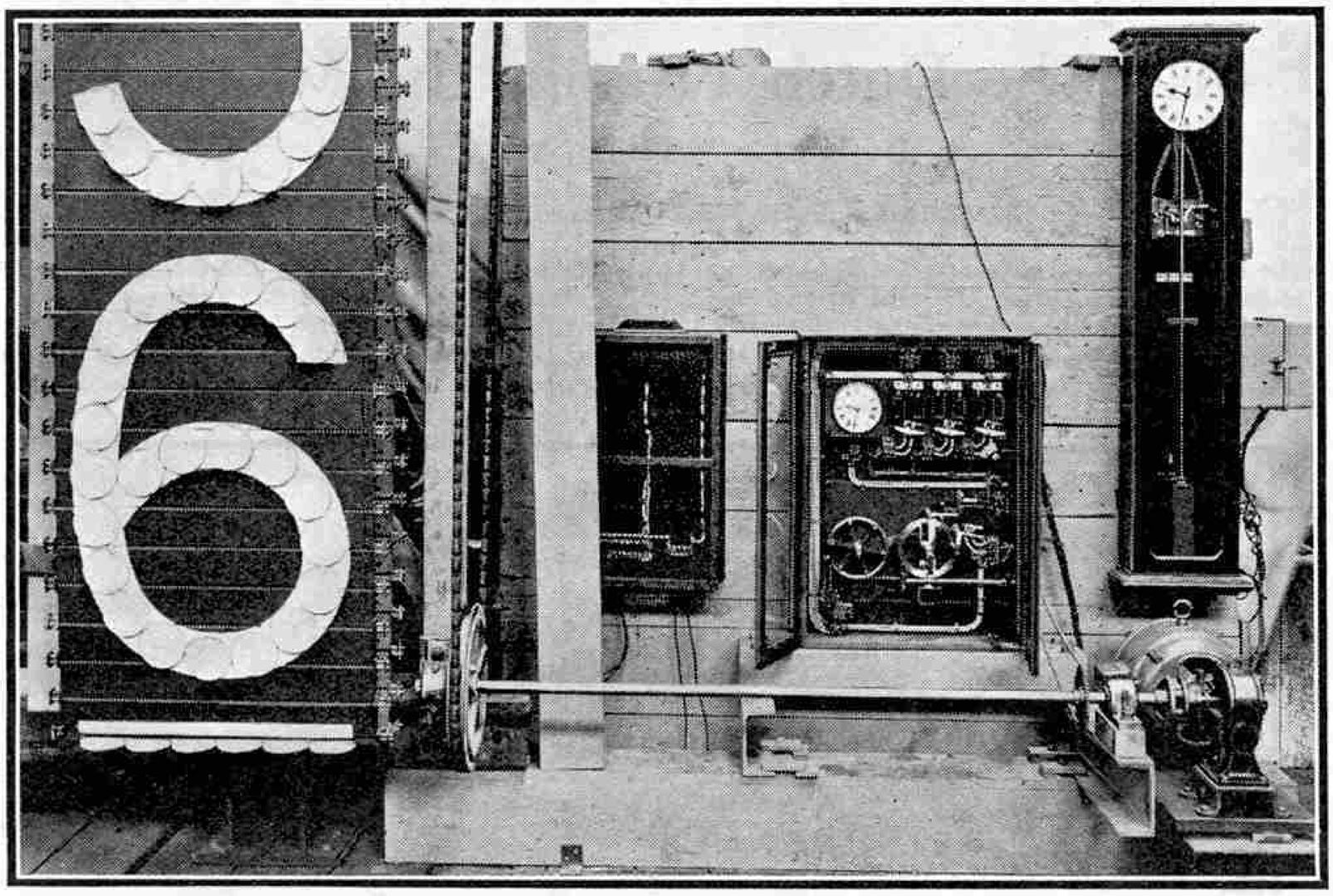
The motive power required for changing the figures is supplied by a special type of electric motor, running continuously at 700 r.p.m. The motor is coupled through a worm reduction gear to a shaft which, by means of a whittle belt, drives a second shaft fixed just behind the figure bands at a point about 3 ft. below the sprockets. On this second shaft are mounted three selective epicyclic gear units, one for each figure band; and it is by the electro-magnetic control of these that the master clock governs the changing of the figures.

The three epicyclic gear units are identical in construction. Each has a central "sun" gear keyed to the motor-driven shaft, and three "planet" gears meshing with the sun gear; and outside the planet gears is a gear with internal teeth. The planet gears rotate on studs attached to a drum that runs freely on the central shaft, and the internal gear is fixed to a second drum, also free to turn on the shaft. A pair of powerful brake shoes is fitted to each drum, and strong coil springs acting on these normally cause the brake shoes on the drum attached to the planet pinions to grip it tightly, the internal gear in the meantime being left quite free to revolve.

Each pair of shoes is fitted with a brake magnet, in addition to the springs. This is an electro-magnet, and the braking effect is reversed when it is energised, the internal gear drum then being firmly held and the planet gear drum released. In each unit the planet gear drum is

coupled to the sprocket of the corresponding figure band by means of a chain drive. While it is held by its brake shoes, the attached figure band therefore remains stationary, the drive from the central shaft merely causing the internal gear to revolve idly; but when the magnet is energised the planet gear drum starts to revolve and the figure band it drives also is rotated.

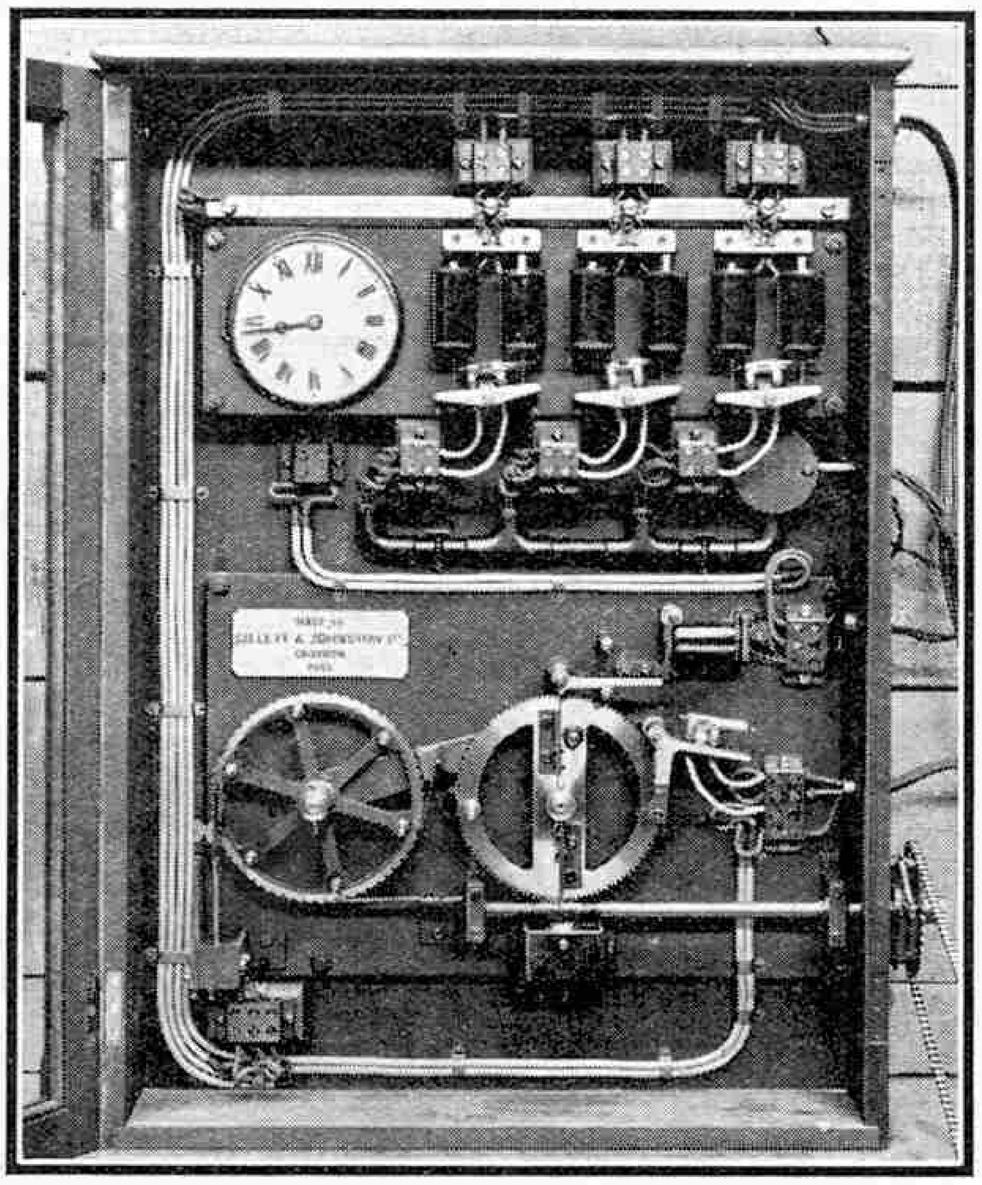
The action of each figure band assembly is entirely independent of the other two, and the movements of all three are controlled by means of a master clock, mounted on a central panel together with the relays by which the timing of release of the planetary gears, and therefore of the figure movements, is effected.



The operating mechanism of the moving figure clock. The driving motor is on the right and above it is the controlling master clock. The control panel is in the centre, and the main driving shaft also can be seen.

The main feature of the control panel is the delay-action device by which the whole chronoscope is synchronised and kept exactly to time. This consists of a worm and worm-wheel, mounted in the lower part of the panel, and having its worm spindle rotated by a light roller chain driven from the first of the two shafts coupled to the main driving motor. The ratios of the chain drive and of the worm gear cause the worm-wheel to make one complete turn in about 50 seconds. Two flat spring catches are fixed at diametrically opposite points on the wheel, and at each half-turn one of these engages with the locking pallet of an electro-magnetic trigger release.

The magnet of this release is included in the half-minute circuit of the master clock, and as the worm-wheel is turning slightly faster than one turn per minute, it follows that each of the spring catches comes to rest on the pallet a few seconds before the completion of the true half-minute, and is held there until the energising of the release magnet by the master clock about five seconds later. The locked catch is immediately released, and the worm is then able to advance the worm-wheel a further half-turn before it is again arrested and synchronised. To allow of the slipping of the drive from the motor-driven shaft during the periods when the catches are locked, the chain wheel on the end of the worm spindle is attached by means of a spring clutch.



Close-up view of the control panel, showing the timing wheel, driven by worm gear, and the relays governing the movements of the figures.

The wheel carries in addition to the two catches, a steel pin, and once during each rotation this pin rocks over a mercury tube switch and completes a low-voltage circuit through one of the coils, or solenoids, of the minute relay. This relay is one of three fixed at the top of the control panel, and each has two solenoids, known in each case as the "on" and "off" solenoids respectively. When current flows through the "on" solenoid on this relay it completes a second circuit and brings into action the brake magnets of the gear unit driving the minute figure-band. Once the relay is "tripped," or brought into action, it will remain in the "on" position until the second or "off" solenoid comes into operation and returns it to the original "off" position. This second solenoid is set in action by the movement of the band itself, for at the moment when the next figure comes into position, a switch is tripped by a cam on the spindle of the figure-band driving sprockets. This energises the "off" solenoid of the relay, and results in the breaking of the circuit through the brake magnets of the epicyclic gear, the band then coming to rest and remaining motionless until the whole process is repeated.

The other two relays mounted on the control panel are for the tens of minutes and hours respectively, and their action is identical with that of the relay already described. The only difference is that the "on" solenoids have additional contacts included in their circuits, and these contacts are closed at the correct moments by pins on a wheel that makes one turn per hour and carries the six pins necessary for the purpose. Five of these close the contacts in the circuit of the 10-minute relay at 10-minute intervals, and the sixth pin, (*Continued on page 979*)

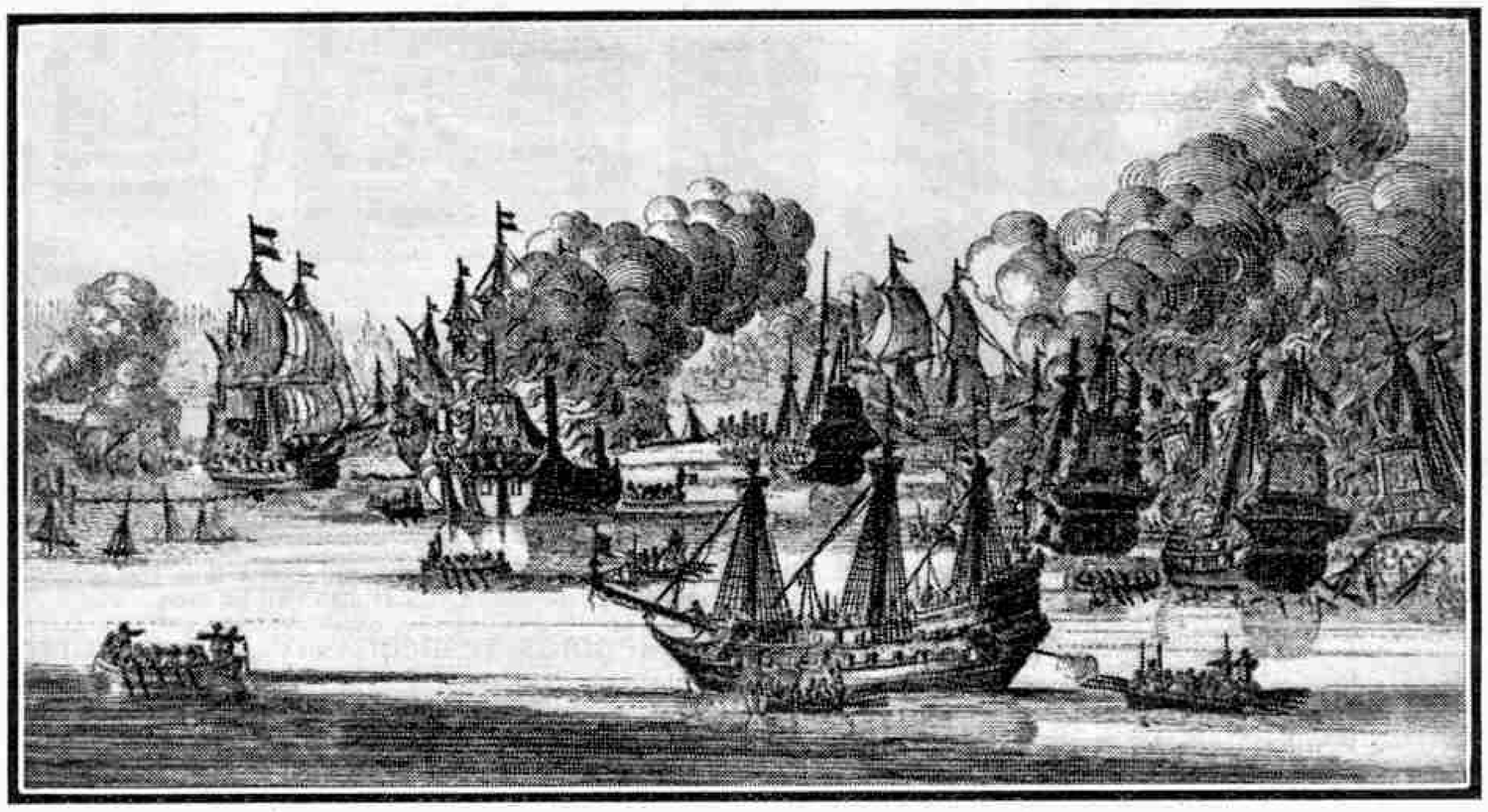
The Story of the Second Dutch War

III. The Dutch Fleet in the Medway

By W. Coles Finch, M.I.C.E.

LAST month we described the four days' battle off North Foreland in June 1666 that ended in a victory for the Dutch, and the second battle there, a month later, when they were heavily defeated. The English followed up their victory by attacking Dutch merchant ships along the coast of Holland and destroying a fleet of 170 of them off the island of Terschelling.

France had allied herself with Holland at the beginning of the year, but she was very slow to give practical assistance. In August 1666, however, it was reported in Holland that the promised French fleet had at last put to sea. On 26th of that month, almost before the English ships had got back to port, Admiral De Ruyter sailed from Holland with a fleet that included 81 ships of the line and 13 fireships, and he steered a course calculated to hasten the meeting with the French fleet. The English fleet, about 100 strong and commanded by Prince Rupert, sailed from Southwold Bay to intercept the Dutch, and first sighted them on 31st August. In hurrying to meet them several of the English ships almost grounded on the Galloper Sands, and by the time they had made detours to avoid the sandbanks the Dutch fleet had passed out of sight. The enemy was sighted again next day, however, sailing towards the French coast. Firing began as soon as the fleets came within range, but a storm arose and both fleets sought shelter, the English hurrying to St. Helens and the Dutch to Dunkirk.



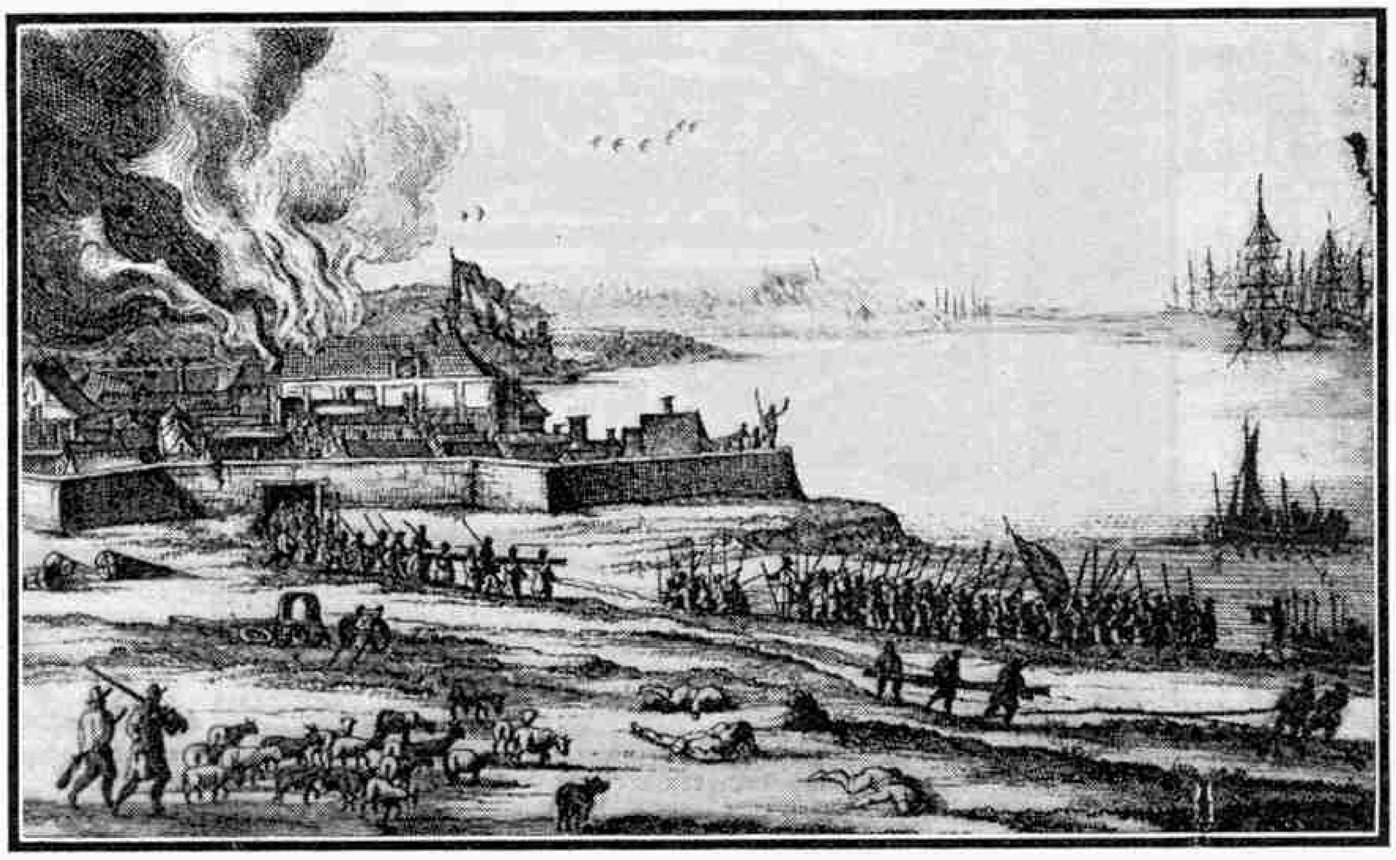
The Dutch burning English ships in the River Medway, 13th June 1667.

The French fleet also encountered stormy weather. The ships became scattered, and one named *"Ruby"* was captured by an English squadron on watch for them in the English Channel; the others got back to port. De Ruyter was greatly disappointed at the failure of his ally to unite with him, and becoming ill with fever he returned to Holland.

The kind offer of the Dutch to return the body of Admiral Sir William Berkeley who had been killed in the June battle off North Foreland, as mentioned last month, had been accepted, and the making of the necessary arrangements gave an opening for suggestions of a peace conference between the two countries. The Dutch were ready to consider terms, but they would not agree to a suspension of hostilities during a conference. Charles II welcomed the possibility of a peace treaty, as he had spent on Court functions large sums of money that should have gone to maintaining his ships and paying the crews. Sweden offered to act as mediator, and a conference between representatives of England and Holland was begun at Breda. The terms demanded by Charles were severe, but in spite of them he anticipated that the conference would be successful. He therefore ordered the dismantling and laying-up in reserve of most of the ships of the Navy. Only two small squadrons were kept in fighting trim, one of which was at Spithead and the other away in the West Indies.

The Conference went on month after month, but the Dutch did not like Charles' terms, and knowing that the English fleet had been reduced almost to nothing they began secretly to prepare for a sudden attack on merchant shipping in the River Thames and on vessels laid up at Chatham, the important naval base 12 miles up the River Medway. By this attack they hoped to avenge Holmes' destruction of the Dutch merchant fleet at Terschelling.

It was important for the success of the proposed attack that it should be unsuspected, and to divert English attention from the preparation of the Dutch fleet in the Texel, a squadron of about 20 ships of the line and four fireships sailed from Holland in April 1667 apparently only to escort a fleet of 150 merchant ships round the north of Scotland. The squadron was commanded by Admiral Van Ghent, and after escorting the merchant fleet to safe waters it paid a surprise visit to the Firth of Forth, and on 1st May appeared off Leith. Van Ghent ordered part of the squadron to sail up the river and destroy the shipping there, but the attempt did not succeed. After bombarding Burntisland and capturing six small vessels he returned to Holland.



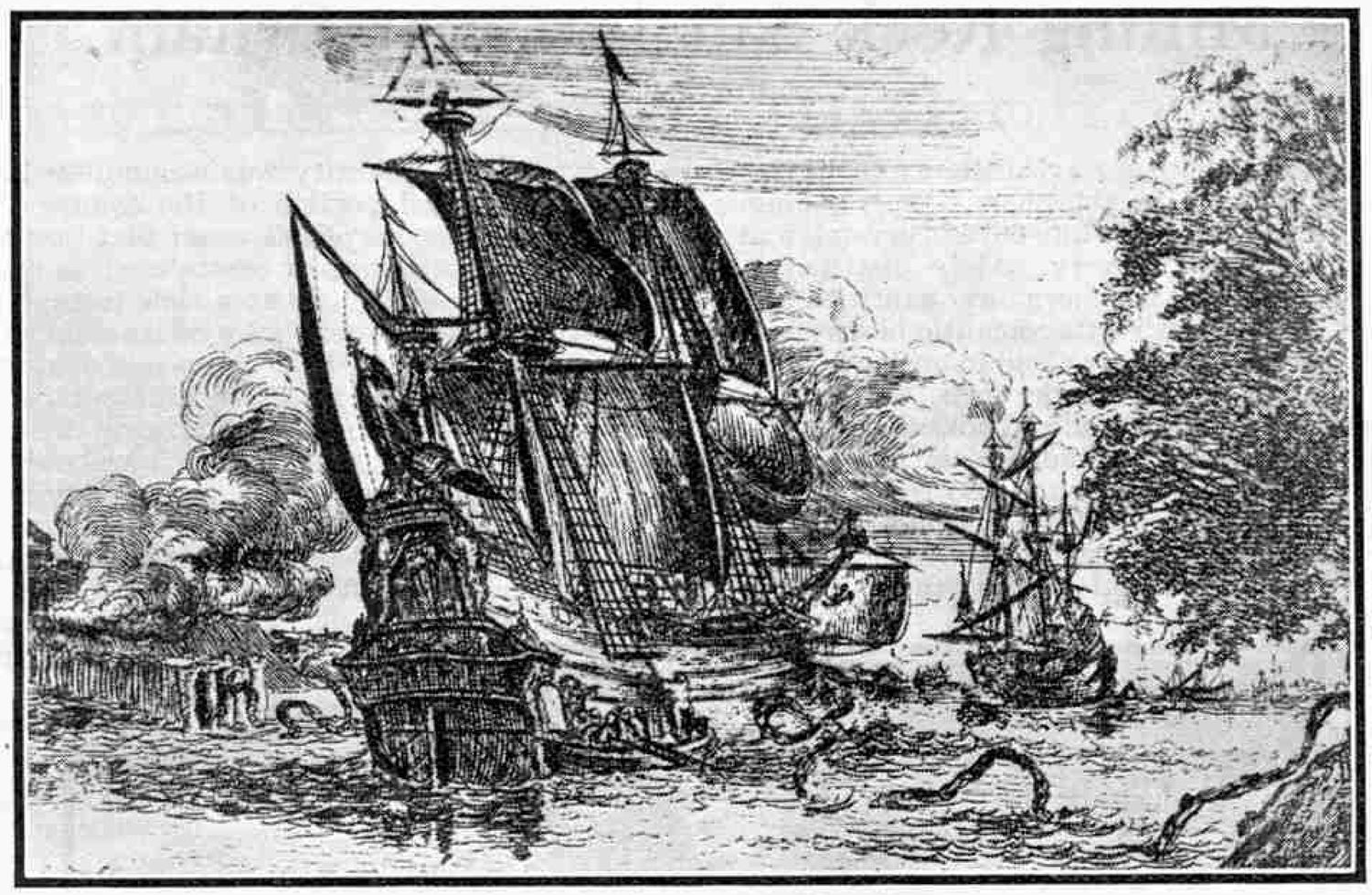
The attack upon Sheerness Fort that preceded the advance up the Medway.

On 4th June the main Dutch fleet sailed for the Thames, and at night anchored off North Foreland. The fleet was again under Admiral De Ruyter, with Van Ghent as second in command, and consisted of 54 ships of the line and frigates, 15 fireships, and 20 smaller vessels, with a total of 3,330 guns and 17,416 men. This formidable force advanced and anchored in the river mouth on 7th June, and that night De Ruyter held a council of war on his flagship and outlined his plan of campaign.

In the early morning of 9th June a squadron commanded by Van Ghent and consisting of 17 ships of the line and frigates, and many of the fireships and smaller craft, sailed up the river as far as

Gravesend, intent upon destroying any frigates and merchant ships encountered. The English ships in the river fled upstream at the approach of the enemy, and difficulties of navigation prevented Van Ghent from pursuing them. He anchored for the night just below Gravesend, and next day returned to the main fleet, which during his absence had moved more into the mouth of the river.

De Ruyter then made ready to attack Chatham, and reinforced Van Ghent's squadron with 10 more ships of the line and two additional fireships. On 10th June Van Ghent again moved off, and by noon he was opposite Sheerness, the naval port at the mouth of the River Medway. He ordered three of his frigates to bombard the fort there, and under cover of the firing 800 soldiers and marines were landed on the shore. The surprise attack succeeded, and 1½ hours later the fort was in the hands of the Dutch. The defenders fled and established themselves in a battery near Gillingham, 2½ miles below Chatham. Dutch records state that the fort contained 50 iron guns, £8,000 worth of munitions, and a large quantity of masts, yards and other ships' stores. The invaders removed everything of value to them and burned the remainder.



The Dutch squadron commanded by Capt. Van Brakel sailing up the river, after breaking through the chain stretched across at Gillingham.

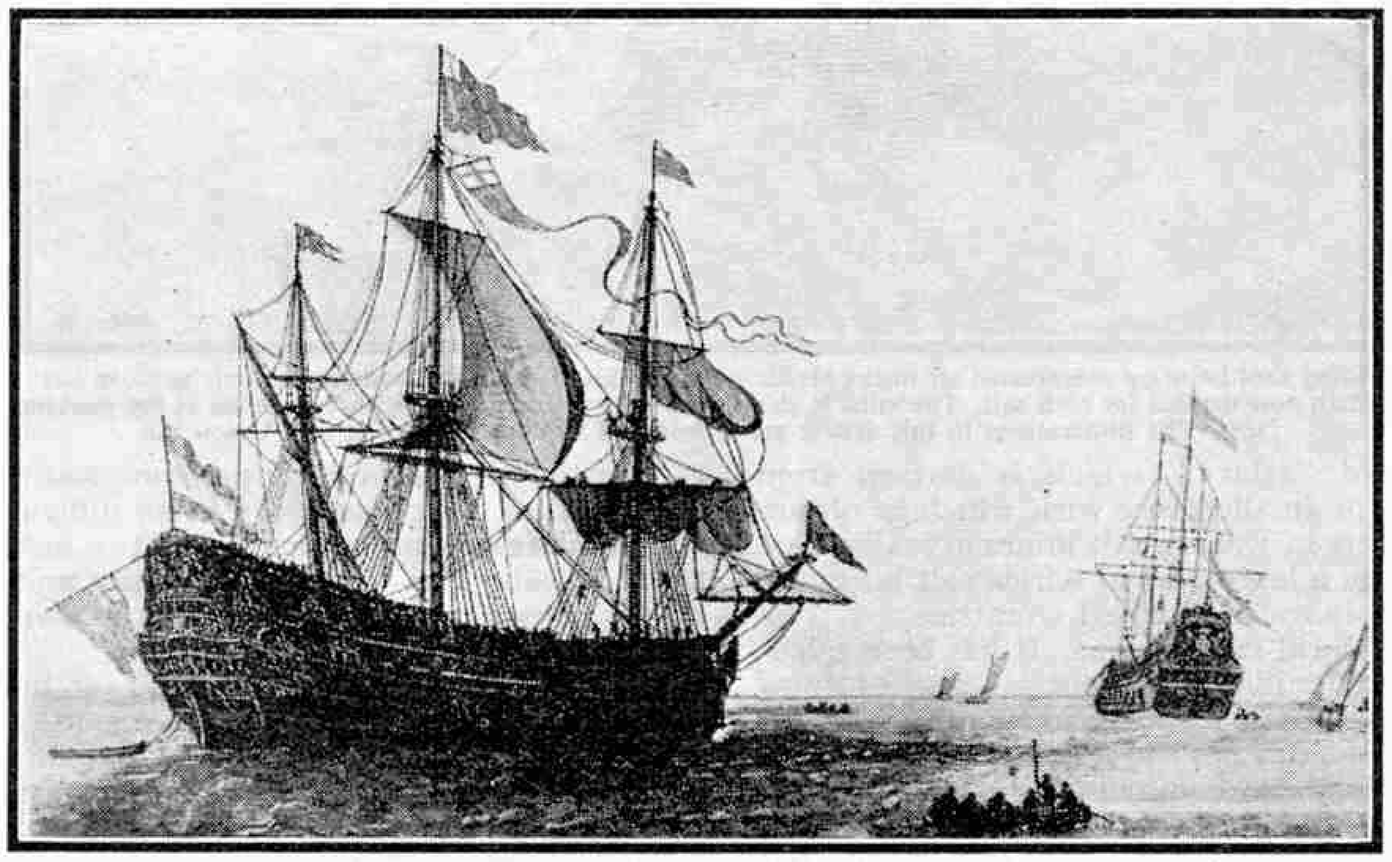
The activities of the Dutch in the Thames and the fall of Sheerness created a panic in London, and the Duke of Albemarle with a body of troops hurried to Chatham to defend it in the event of the enemy getting so far up the Medway. At Chatham he found a deplorable state of affairs. Half the population had fled, the docks were almost deserted, and the officials there were more concerned with removing their private property to safety than in protecting the ships, stores and docks.

Between Gillingham and Chatham the Medway follows a winding course, and in the straight portions or "reaches" between the bends at least 16 large ships of the line were moored. After much difficulty the Duke obtained some workmen, and under his supervision they stretched a strong iron chain across the river at Gillingham, and erected a small battery on each shore to guard it. A frigate named *"Unity"* was then stationed in front of the chain and three guardships behind it. Two of these guardships, the *"Matthias"* of 52 guns and the *"Charles V"* of 53 guns, were captured Dutch ships that had been added to the English Navy. Five fireships were sunk in the river two miles below Gillingham and three fine ships of the line were scuttled higher up the river to obstruct the Dutch fleet. The numerous ships of the line and frigates laid up in the river were rearranged so that the few guns still on them could be trained on the enemy if necessary. One of the ships near the chain was the *"Royal Charles,"* and as she had on board only 32 of her 100 guns the Duke ordered that she should be towed higher up the river out of danger, but for some reason the order was not carried out.

The expected Dutch attack on Chatham took place on 12th June. The *"Vreede,"* of 40 guns and commanded by Capt. Van Brakel, was the first to approach the chain, and she engaged the *"Unity"* and soon captured her. In the meantime one of the Dutch fireships broke through the chain and attacked the *"Matthias"* and set her on fire, and she blew up shortly afterwards. The *"Charles V"* also was set on fire, and she burned all day, finally blowing up. Van Brakel engaged the *"Carolus Quintus,"* an English ship of the line, and although she had sunk one Dutch fireship and driven off another she surrendered to the Admiral. This was an important capture, and Van Brakel quickly used it to advantage by training the ship's guns on to the shore batteries at the ends of the chain, and silencing them.

So far the attack had gone well. De Ruyter with the remainder of the fleet arrived on the scene, and a general attack on the English ships in the river developed. The partly-armed *"Royal Charles,"* with only a few seamen on board, was an easy prey, and as soon as she had been captured the Dutch flag was hoisted and Van Ghent used her as his flagship for the remainder of that day. When darkness came the sky was lit up by the flames of burning vessels.

The Dutch fleet anchored between Gillingham and Upnor for the night, and they resumed the attack next day. De Ruyter ordered six of his ships of the line to advance and engage the defenders stationed in Upnor Castle and in a battery on the opposite bank of the river, while his flagship got past. The ruse was successful, as although the shore batteries maintained a heavy fire they did not succeed in keeping back the enemy. Five fireships were employed to destroy the *"Loyal London," "Royal James"* and *"Royal Oak,"* the three scuttled ships of the line, which, owing to having sunk in shallow water were only slightly submerged. The *"Royal Oak"* was taken only after a hard fight. She was defended by Capt Douglas, an army officer who had been ordered on board her for the purpose. When the Dutch closed in upon the ship Douglas was advised to retire, but he refused and declared that "never shall it be said that a Douglas quitted his post without orders." When the ship was set on fire he perished with her.



The "Royal Charles" and the "Unity," which were captured by the enemy, being taken to Holland.

A little higher up the river lay nine other large ships, but as the Dutch had only two fireships left, and had to face the dangers of the return trip down the winding river, they resisted the temptation to attack these vessels. They made their way downstream without mishap, and took with them the *"Royal Charles,"* "at a time," says Pepys, "when the best pilot in Chatham would not have undertaken it, they heeling her on one side to make her draw a little water, and so carried her away safe." They also took the *"Unity"* with them.

While the Dutch were having such a good time up the River Medway hurried preparations were made at London, Gravesend and other places near the mouth of the Thames, against the enemy again sailing up the river. New fortifications (*Continued on page 1026*)

The Romance of Salt

Mining Rock Salt in Great Britain

TO most of us common salt is a white grainy substance that gives a pleasant flavour to our food. To the chemist it is sodium chloride, a substance that forms beautiful white cubical crystals and is extensively used in industry. It is very widely distributed, occurring in the earth, in rivers and seas in enormous quantities, and is so familiar to us that we scarcely realise its romantic history and the extraordinary veneration in which it was held in ancient times, when it was termed "a substance dear to the gods."

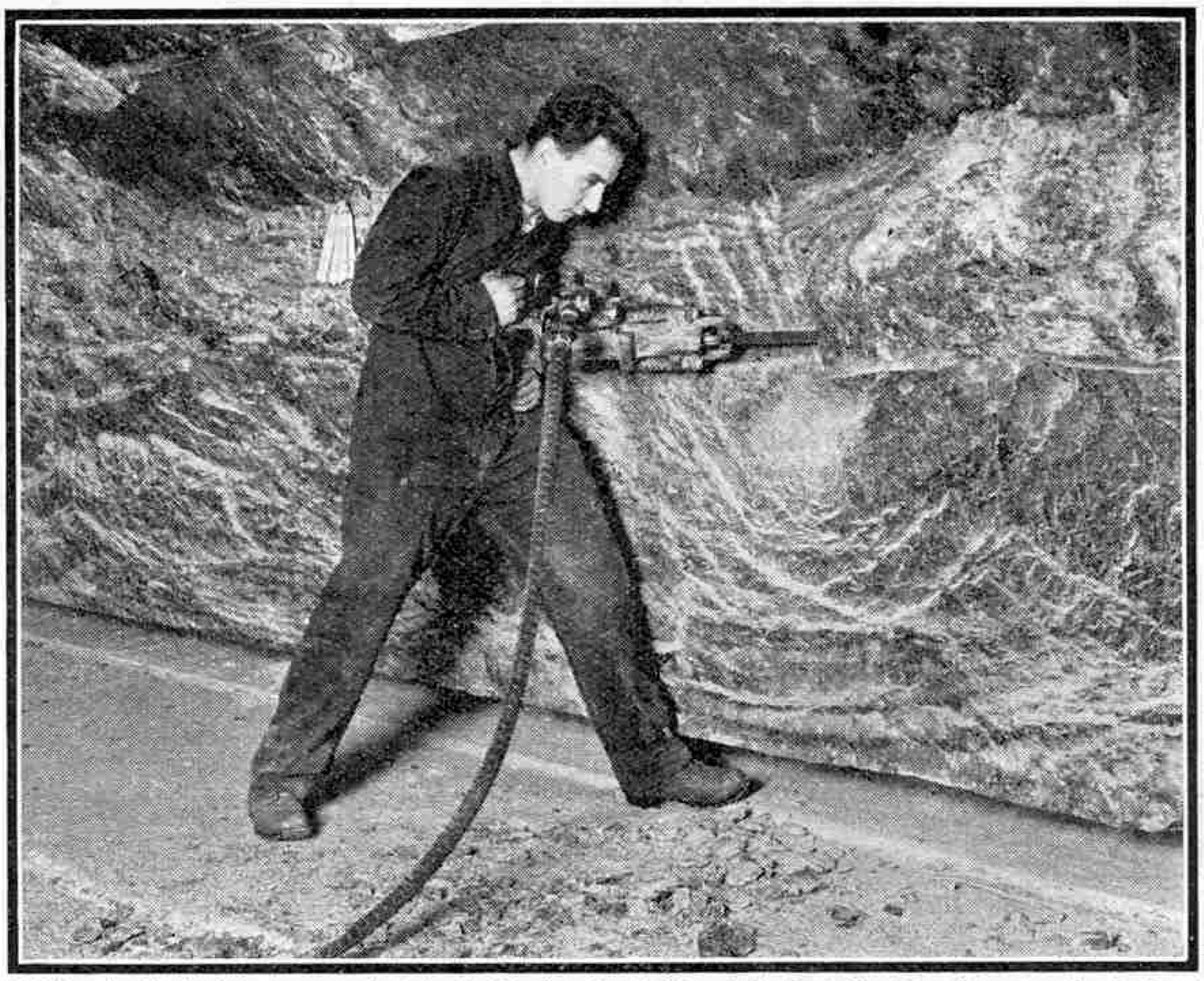
There are many references to salt in the oldest books of the Bible, in which the Israelites are continually reminded to include salt in all their offerings. The Greeks and the Romans also regarded salt as sacred and made use of it in their sacrificial offerings, and the superstitious custom of throwing a little spilt salt over the left shoulder to propitiate the gods is a survival of these ancient customs. The followers of Pythagoras, an ancient Greek philosopher, regarded salt as an emblem of justice, and in ancient times nothing could be more binding than a "covenant of salt," made by eating bread and salt to seal a bargain or treaty, and this practice is said to be followed in the East to this day.

A present of salt also was long regarded as a symbol of friendship and hospitality. A few centuries ago a salt cellar was placed in the middle of the long table round which a nobleman and his followers assembled for meals. There it marked the boundary between the family and their guests on the one hand, and the servants and people of meaner quality on the other, and to sit "above the salt" was a coveted honour.

The high regard in which salt was once held is shown in the use of such a phrase as "not worth his salt" to describe an idle fellow, and of the word "salary," which is derived from "salarium," the Latin word for an allowance with which to obtain salt. It is believed that workers in Roman salt mines actually were paid in salt, and even to-day in a large part of Africa salt takes the place occupied by metallic coinage in civilised countries.

The quantity of salt in the world is enormous. It has been calculated that every year about 160 million tons of it are washed down to the seas by rivers, and enough salt has been accumulated in the oceans to cover the whole of the dry land to a depth of 400 ft. For ages salt has been obtained in warm countries by using the Sun's heat to evaporate sea water, and in colder regions salt water is concentrated to a strong brine by freezing out the water; but to-day most of the world's salt is obtained from mines or by pumping brine from underground sources. Some of the salt mines are enormous in extent. For instance the galleries of those at Wielicza, in Galicia, are said to have a total length of 30 miles. These mines have been worked for 600 years, and a salt town in the mines includes a church and a market place. In Great Britain the chief salt deposits are found in Cheshire and Worcestershire, where there are many towns and villages, such as Northwich and Droitwich, with names ending in "wich," the Anglo-Saxon name for a place where salt was dug.

The bed of salt below the surface of the ground in Cheshire have been estimated to contain no less than 15,000 million tons of salt. This immense quantity was accumulated ages ago, when what is now the central portion of the county was the site of swampy marshes or lagoons of salt water that formed an arm of a great sea. From these lagoons salt crystallised as the water was evaporated during hot periods, and from time to time the supply of salt water was replenished, probably by tidal action. The process of depositing salt continued for 20,000 years and perhaps longer, and seems to have been divided into two different periods, for there are two horizontal beds of rock salt varying in thickness from 80 ft. to 150 ft., and these layers are separated by about 30 ft. of marl and hard marlstone. This marl is a clayey limestone that probably was deposited in the lakes in very wet times, and the beds of this material and of salt tell the story of past climatic changes. A proportion of this material of course always found its way into the marshes or lakes and gives the rock salt its peculiar reddish brown colour. Occasional blocks of beautiful white crystalline salt are found in the Cheshire salt beds, but the greater part of the rock is opaque and has an average purity of about 94 per cent.



Drilling shot holes by compressed air in the Meadow Bank Mine, Winsford, Cheshire, the only mine in Great Britain now worked for rock salt. The mine is electrically lighted and floodlights are installed at the working faces. The illustrations to this article are reproduced by courtesy of The Salt Union Ltd.

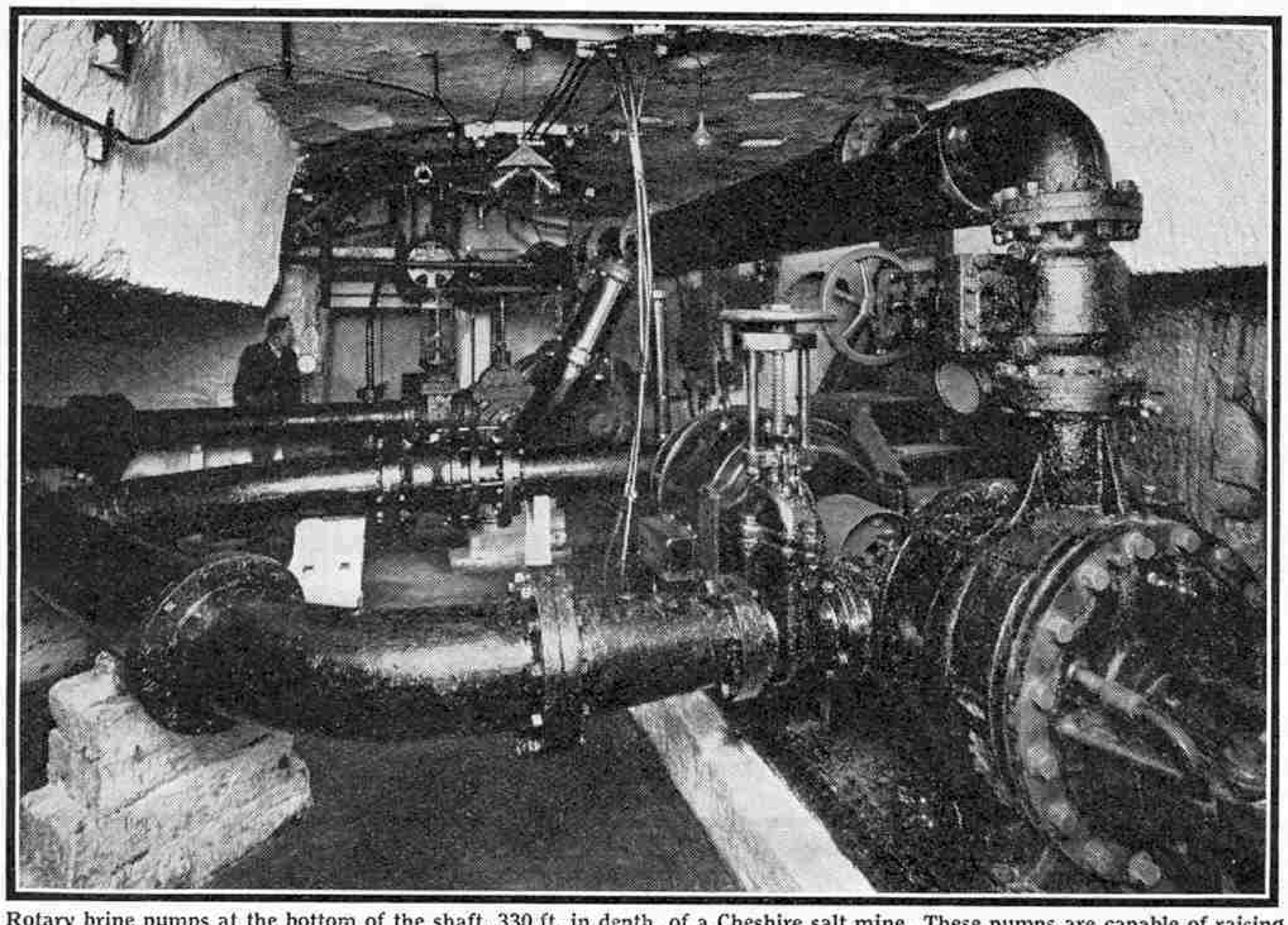
Salt is used so widely, and is essential in so many different ways, that it has often been made the subject of taxes. Cheshire salt has been no exception to this practice. Duties on salt produced in the county added considerably to the wealth of William the Conqueror and also of the Anglo-Saxon kings who ruled before him, and at various other times have been a burden to salt producers and the subject of strife. Little more than 100 years ago there were no less than 68 excise officers in Northwich alone. The tax had then been increased to help to pay for the Napoleonic Wars, and at one time it reached £40 per ton. Naturally this made the price so high that the poorer people had difficulty in obtaining it. Stealing therefore became common, and two men once were publicly hanged at Chester for this crime. Meat and fish often were destroyed or allowed to go bad because the owners could not purchase the salt necessary to preserve them.

The first written record of salt production in Cheshire is found in Domesday Book, but brine pans made of lead discovered in various places have been identified as Roman vessels and prove that salt making has been practised in the county for about 1,900 years. The brine used by the Romans no doubt came to the surface naturally, and springs were the chief source of the brine evaporated by their successors. Later the liquid was raised from wells in leathern buckets, and eventually it became necessary to sink shafts in order to reach it.

The beds of rock salt were not discovered until about 1700, when their presence was revealed during boring operations in search of coal. For 100 years or more salt then was extracted by ordinary mining methods. Ground water constantly soaked into the mines, however, dissolving the roofs and supports of the galleries, and in time most of the mines collapsed from this cause. The flooded workings then became vast reservoirs of natural brine, for the water comes from the "Flashes" or lakes that abound in the district and ensure a constant supply of fresh water. The practice of pumping

the liquid to the surface and evaporating it then began. Evaporation of course is costly, but the plan has many compensating advantages. The brine is more easily brought to the surface than is rock salt, and the product is purer, since the earthy impurities that give rock salt its colour are not dissolved by water and thus do not find their way into the crystals of the finished product. Evaporation of brine also can be made to give salt of different grades for different purposes.

Although brine pumping and evaporation provide by far the greater proportion of the salt produced in Cheshire, the rock itself is still mined. This is done in the Meadow Bank Mine, Winsford, which was closed down in 1888 after 33 years of activity, but was again brought into service a few years ago. It is the only salt mine now worked in this manner in Great Britain, and it owes this distinction to the fact that it is the only one of three mines in Winsford that has not become flooded. It was brought into production two weeks after re-opening, and a few months later had been completely equipped with modern machinery to enable the salt to be mined and brought to the surface rapidly and easily.



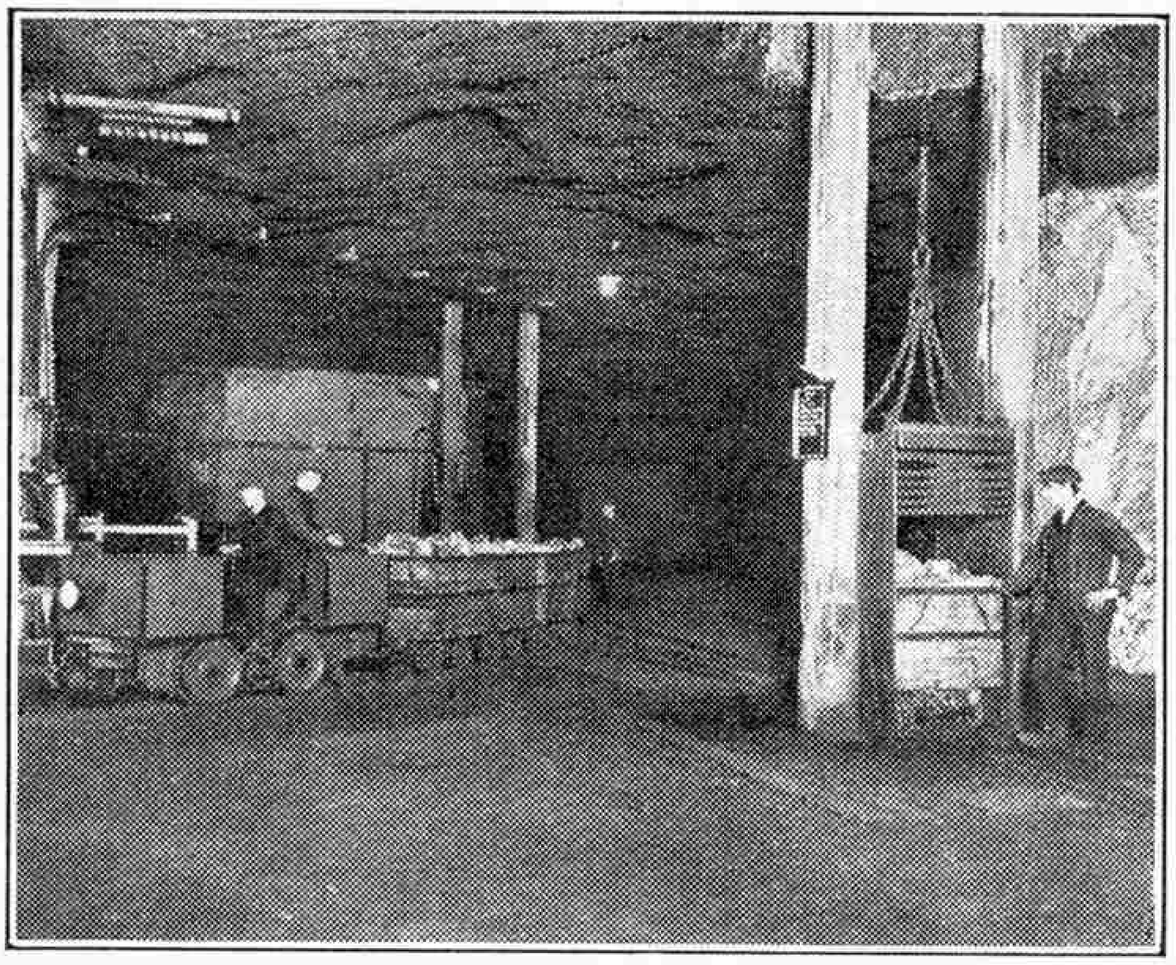
Rotary brine pumps at the bottom of the shaft, 330 ft. in depth, of a Cheshire salt mine. These pumps are capable of raising 45,000 gallons of brine an hour and the walls of this underground pumping station are of rock salt.

The upper layer of salt in the Meadow Bank Mine is 70 ft. in thickness and lies at a depth of 253 ft. Below it comes a 30-ft. layer of marl, and this is followed by a lower bed of rock salt 121 ft. in thickness that reaches a maximum depth of 474 ft. below the surface. Two shafts lead downward to the underground workings. Each is 4 ft. square and 457 ft. deep, and is timbered to a point 200 ft. from the top in order to exclude water from the surface that otherwise might penetrate into the mine by way of the shaft.

The underground workings in the mine form a labyrinth of lofty chambers separated by pillars of salt left in position to support the roof. These pillars are 20 ft. to 30 ft. in height and have a cross sectional area of about 108 sq. ft. There are now more than 50 of them and they are spaced 75 ft. apart.

Driving the galleries at Winsford resembles tunnelling in that a heading from 6 ft. to 7 ft. deep is driven several feet in advance of the main gallery. The advance heading is called the "roofing" because it is the section immediately below the roof of the mine, and the rest of the rock salt layer forms a kind of bench, which is removed in a series of steps. At the working face the hard rock salt is undercut by electrically-driven machines that penetrate it at the rate of 4½ in. to 9 in. a minute and horizontal shot holes are bored into it at an angle to the face by means of light compressed air drills called "Jackhamers." The holes are then loaded with explosive and the charges are fired by means of slow fuses. This breaks up the rock, which is loaded into trucks for transport to the bottoms of the shafts. Compressed air driven paving breakers are used to split pieces of rock salt that are too large for handling, and the roof and sides of the gallery are trimmed with pneumatic picks.

The loaded trucks are hauled along the 20-in. track in the mine by storage battery locomotives, the accumulators of which are recharged at stations near the foot of the shafts. Winding also is electrical, a 45 h.p. motor driving the 6-ft. winding drum employed in hoisting the rock salt to the surface. The mine is well lighted throughout by electricity, floodlights at the working faces giving ample illumination; and as the underground temperature remains almost constant all the year round at 54 deg. F., and there are no noxious or explosive gases in the galleries, working conditions in the mine can be described as ideal.



The bottom of one of the shafts of the Meadow Bank Mine, showing the hoisting cage and the electric locomotive that hauls the laden trucks.

The salt required for most of the purposes to which this chemical is put is obtained by crystallisation from the brine pumped out of the flooded mines. Saturated brine contains about 1 lb. of salt to every 3 lb. of water, and for centuries the water was removed by simple evaporation in open pans. This method is still used to a certain extent, the pans being shallow rectangular vessels with an average capacity of 10,000 gallons. They are fired by coal or producer gas, and in some cases steam heating is employed. The salt crystallises out as evaporation proceeds and is raked to the sides, to be withdrawn by means of perforated shovels. It is then allowed to drain and is warehoused.

Although evaporation in open pans seems to be primitive and wasteful, no better method of extracting the salt was devised until about 30 years ago, when the vacuum evaporator was introduced. This is now applied on a large scale. Usually three stages are provided, and the largest and finest example of what is called a triple effect vacuum evaporator plant is that of the Salt Union Ltd., at Weston Point, Runcorn, Cheshire. This is capable of an output of 4,000 tons of salt per week, corresponding to the evaporation of about 12,000 tons of water. The works are situated on the Manchester Ship Canal, and large ocean-going steamships can readily be loaded directly from them. Runcorn of course is 11 miles from the Northwich area, where the brine is obtained, and the liquid is pumped to the works over this distance through pipes.

The evaporating plant at Runcorn consists of three cylindrical iron vessels or pans, each of which is 25 ft. in diameter and 66 ft. in height. They are conical in shape at the top and the bottom, and steam is passed through an annular belt containing hundreds of vertical tubes through which the brine circulates as it is heated. The first pan is supplied with steam from a separate boiler. As the brine in it evaporates the steam liberated passes (*Continued on page 985*)

The D.H. "Comet"

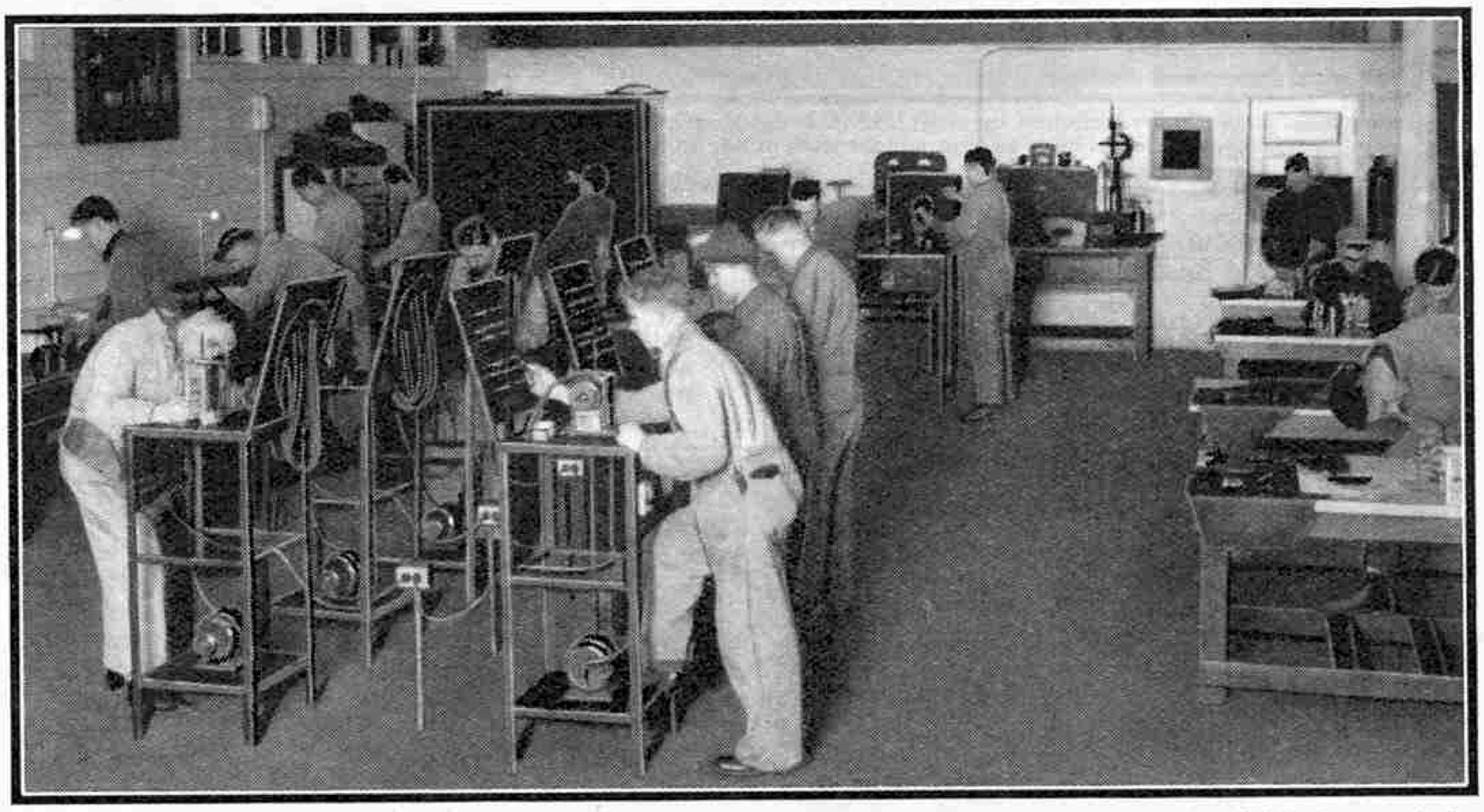
We hope to publish in an early issue a full and illustrated description of the de Havilland "Comet," in which Mr. C. W. A. Scott and Mr. Campbell Black won the MacRobertson Air Race by flying from England to Australia in the amazing time of 2 days 23 hrs. In the meantime, a few facts about the machine will be of interest.

The "Comet" is a low wing cantilever monoplane fitted with two engines carried in nacelles slung under the wing on each side of the fuselage. It is not a freak type, but, with slight modifications, is suitable for the operation of mail and express freight services. There can be little doubt that in the near future mails will be sent in speedy machines flown by relays of pilots, and that passengers will be carried in the slower but more comfortable types now used for mails and passengers. The "Comet" is built entirely of wood and has exceptionally clean lines. The pilot's cockpit for instance, is well back from the nose, so that the covering will interfere as little as possible with the airstream; while the surface of the fuselage and wings has been rubbed down and polished all over, thus adding a few miles to the speed. The wings are very thin and narrow, the greatest depth being only 11 in.; and they are similar to those of the D.H. "Diana," described on page 970 of this issue, in having a pronounced taper. The only way in which they could be made strong enough without increasing the weight too much was by using 2 in. strips of planking laid diagonally one on top of another, over an internal structure of spars, ribs and stringers. Each strip is pinned and glued in place on the machine. The same system has been used for parts of the fuselage.

Aeronautical engineers have stated that the "Comet" is the most efficient aeroplane that has ever been produced, and because of this fact it would normally have a very small gliding angle when landing, which would be a disadvantage on a small aerodrome. To overcome this the wings are provided with special flaps between the engine nacelles and the fuselage, and when a pilot wishes to land he lowers these flaps so that the drag of the machine is greatly increased. An interesting form of retractable undercarriage has been developed, the wheels lifting up and being stowed away into the engine nacelles once the aeroplane is in the air. The speed is increased by 18 m.p.h. by this.

Controllable pitch airscrews are employed, and these are driven by two D.H. "Special Gipsy Sixes." Each of these normally operates at 2,350 r.p.m. and develops about 230 h.p., but when flying at a height of 10,000 ft. the full throttle output is 160 h.p. at 2,250 r.p.m. Engine trouble was experienced during the race because the best fuel mixture was not known.

The "Comet" is 44 ft. in span and 29 ft. in length, and weighs 5,250 lb. when fully loaded. Full details of its performance are not yet available, but some idea of its powers can be gained from the fact that the Mollisons flew from Mildenhall to Baghdad at an average speed of 200 m.p.h.



Testing and repairing aeroplane magnetos at the United States Air Corps Technical School, Illinois. This official photograph is published by courtesy of the U.S. Army Air Corps.

Regular Transatlantic Mail Flights

It is hoped that next year regular flights across the South Atlantic will be made by mail-carrying machines of Air France, the well-known French air line company. This step is to be taken in connection with a progressive speeding up of the company's air line from Europe to South America. The first step has already been taken, a distance of some 800 miles having been taken off the water journey, saving a day.

Until recently the mails were flown to Dakar on the African coast and then carried by despatch boat to Natal on the Brazilian coast. Now, however, they are flown to the Cape Verde Islands, a distance of approximately 450 miles, while the despatch boat leaves the mails at the islands of Fernando de Noronha, some 300 miles from the Brazilian mainland. It has always been thought that landplanes could not make use of these islands, but runways have now been constructed on them so that the Fokkers used can alight safely. It is hoped that by the summer of next year the whole of the service will be operated by air, which will necessitate a sea crossing of 1,400 miles. Seventeen Atlantic flights have already been made by pilots of the company, one pilot having made nine crossings in the Couzinet *"Arc en Ciel,"* and several others more than one.

Russians Claim Non-Stop Flight Record

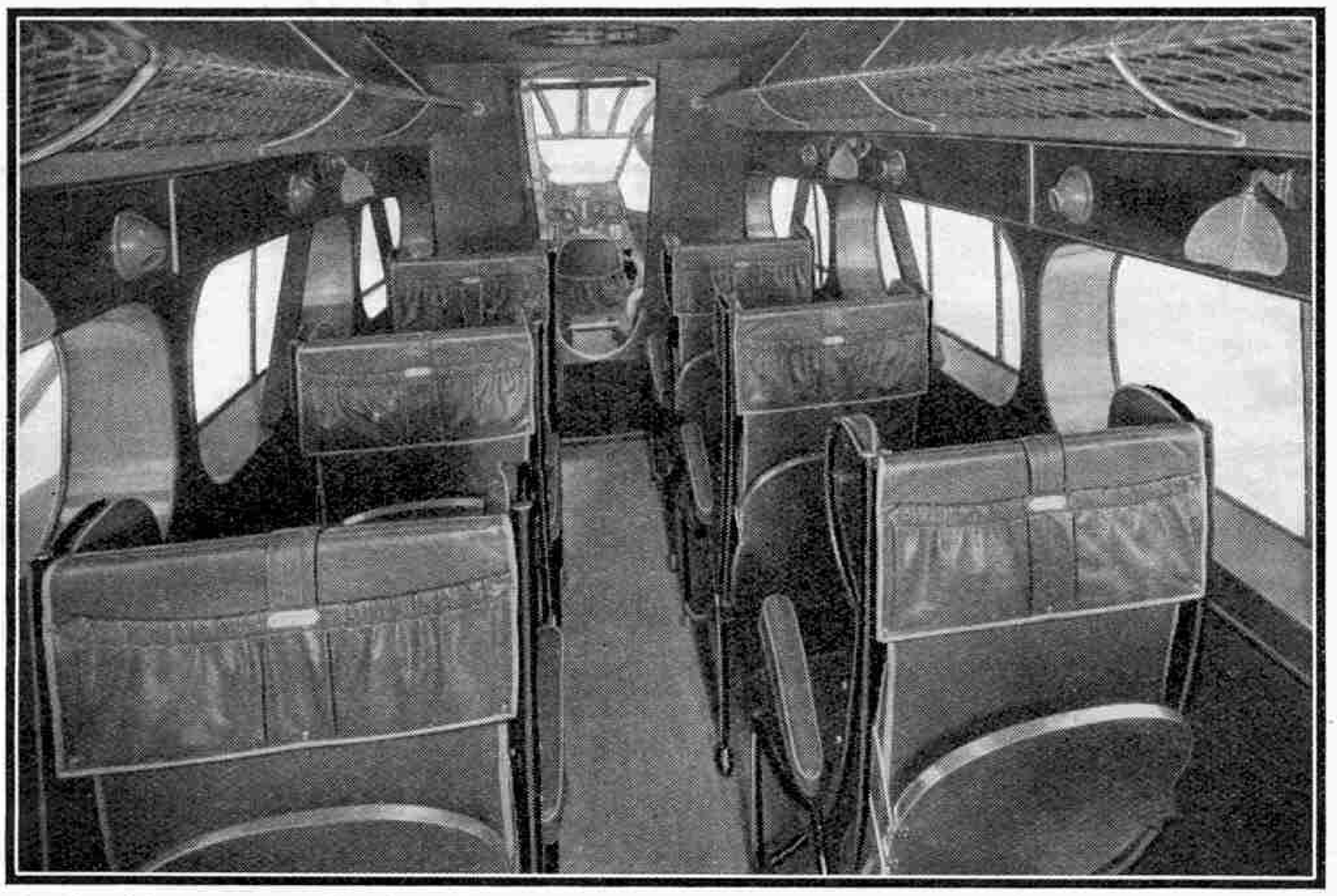
A non-stop flight record is claimed by the U.S.S.R. for three Soviet aviators who are stated to have flown a distance of 7,712 miles without landing or refuelling. The flight was made in a Russian-built bomber up and down a line between Moscow and Kharkov, three days and three hours being occupied in the attempt.

Aeroplanes as Ambulances

In many cases recently conclusive evidence has been given of the value of aeroplanes for the transport of sick people. The other day, for instance, Imperial Airways were consulted by a doctor, one of whose patients had just undergone a serious operation and was in an extremely weak condition. It had become urgently necessary that, if possible, the patient should travel to Zurich, in Switzerland, to undergo a special course of treatment at a clinic there.

In view of the patient's condition a train and boat journey was out of the question, and the only chance lay in making the trip by air. In these circumstances it was arranged that the forward saloon in one of the big four-engined air liners on the Croydon-Zurich service should be reserved for the patient's accommodation. A bed was arranged in this saloon in such a way that the patient, while lying in it, could obtain an excellent view outward through the windows of the air-liner. There was also ample space in the saloon for the doctor, a nurse, and one of the relatives of the patient.

A motor ambulance from a West-end nursing home was driven up beside the air liner at Croydon, and the patient was conveyed to the bed in the saloon. The flight began at 8 a.m. and by 2.15 p.m. the same afternoon Zurich was reached. The patient, who had suffered no ill-effects from the aerial journey, was transferred to a waiting motor-ambulance and an hour later was under treatment in the Zurich clinic.



Interior of the passenger cabin of the "Delphinus," which is described on page 970 of this issue. Our photograph is reproduced by courtesy of Imperial Airways Ltd.

Another Atlantic Flight

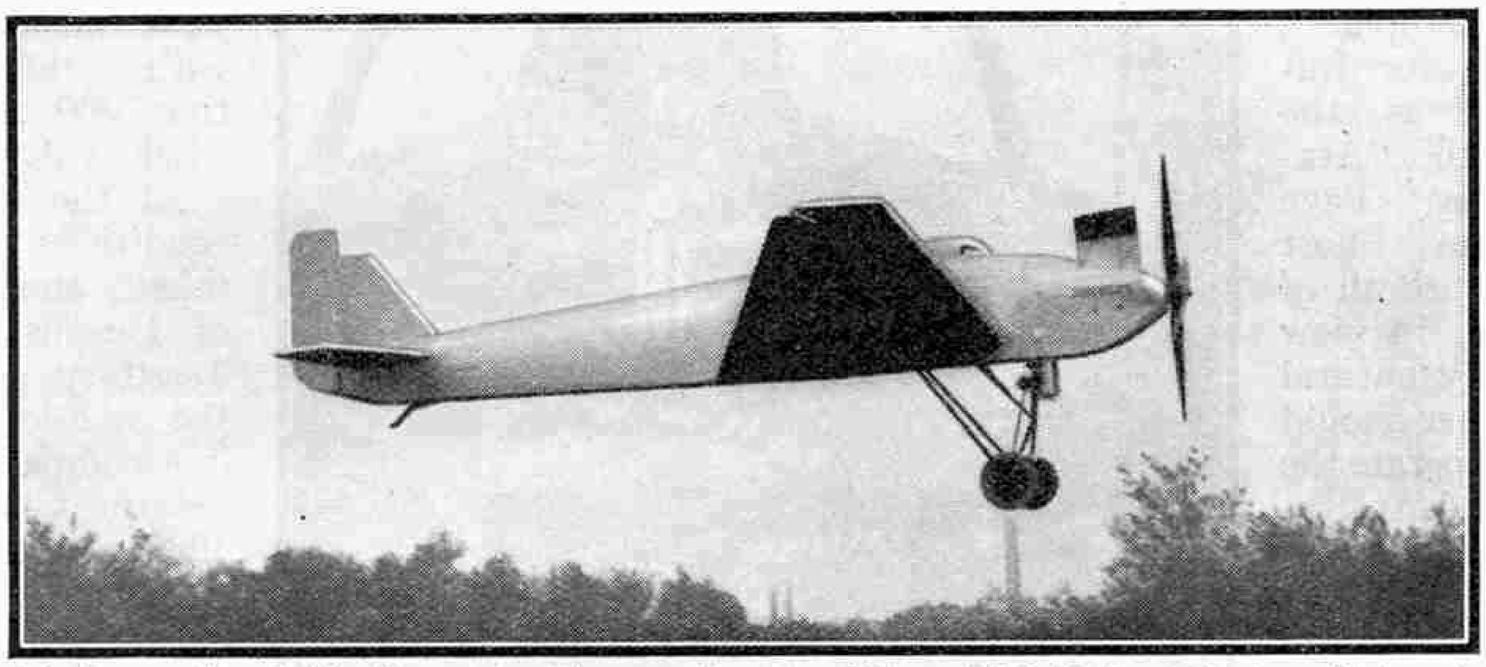
While many Atlantic flights are heralded with wide publicity in the press, very little has been heard of one that was made a short time ago by an American doctor. This flight was by way of Newfoundland, Labrador, Greenland, Iceland, the Faroe Islands, and Kirkwall in the Orkneys. Afterwards the flight was continued to Edinburgh.

Flights of this nature are of far more practical value to aviation than many of the more sensational non-stop attempts, for they make people realise how safe and "matter of fact" flying really is. The man who made the trip is Dr. Richard Light, and he was accompanied by Mr. Albert Wilson, a graduate of Yale University, who acted as wireless operator. Emergency rations for a month were carried in the aeroplane in addition to four gallons of drinking water, a rubber sailing boat and a tent.

New World Speed Record

Another world speed record has been set up by Warrant-Officer Francesco Agello of the Italian Royal Air Force, who flew four times over a measured course at Lake Garda at an average speed of 709.202 km./hr., equivalent to about 440.677 m.p.h.

Warrant-Officer Agello was flying the Macchi-Castoldi 72 seaplane on which he set up the previous record of 423.76 m.p.h. The engine is a Fiat with 24 cylinders, and in order to keep the frontal area as low as possible these are arranged in two banks that form a 60 deg. "Vee." They are, however, in two mechanically-independent units each of 12 cylinders. The crankshafts of these units rotate in opposite directions and drive separate airscrew shafts, that from the rear engine being carried through the crankshaft and airscrew shaft of the front unit.



A Junkers machine that has been produced for research work on high speed flying in the stratosphere. Photograph by courtesy of Junkers Flugzeugwerke, A.G.

Fast New Airspeed Machine

Another low wing monoplane has been produced by the Airspeed Ltd., the constructors of the famous Airspeed "Ferry" and "Courier" machines, which have been fully illustrated and described in the *"M.M."* The new machine has been named the "Viceroy," and it is of the twin-engined type. It is capable of cruising at a speed of about 190 m.p.h. when carrying six or eight people in the cabin. It is of all wood construction and is of typical low wing cantilever monoplane design with tapering wings and engines mounted outboard in nacelles. A special retractable type of undercarriage is provided and, as is now the custom, it is equipped with electrical indicating gear in the cockpit so that an electric horn is sounded if the throttle is closed while the wheels are still up.

The machine is 52 ft. 4 in. in span and 54 ft. 6 in. in length, and is capable of carrying a disposable load of about 2,500 lb. The engines used are two Armstrong Siddeley "Cheetah" air cooled radials, supercharged to give 315 h.p. at 2,300 r.p.m. at 7,000 ft.

The Australian Air Mail Service

The Singapore-Brisbane section of the new air mail service from London to Australia is to be inaugurated on the 8th of this month, when the first through air mails will leave Croydon Airport. They are due at Brisbane on 20th December. The service in the reverse direction will normally leave Brisbane on Wednesdays, but the first machine to leave will do so on Monday, 10th December, in order to enable the Duke of Gloucester to take part in the inauguration ceremony. The scheduled transit time between London and Brisbane is 12½ days in each direction, and if the service is satisfactorily operated during the first three months passengers probably will then be carried from Singapore to Australia by air. Aeroplanes on the service will carry enough collapsible rubber boats to take all the occupants in the event of a descent at sea.

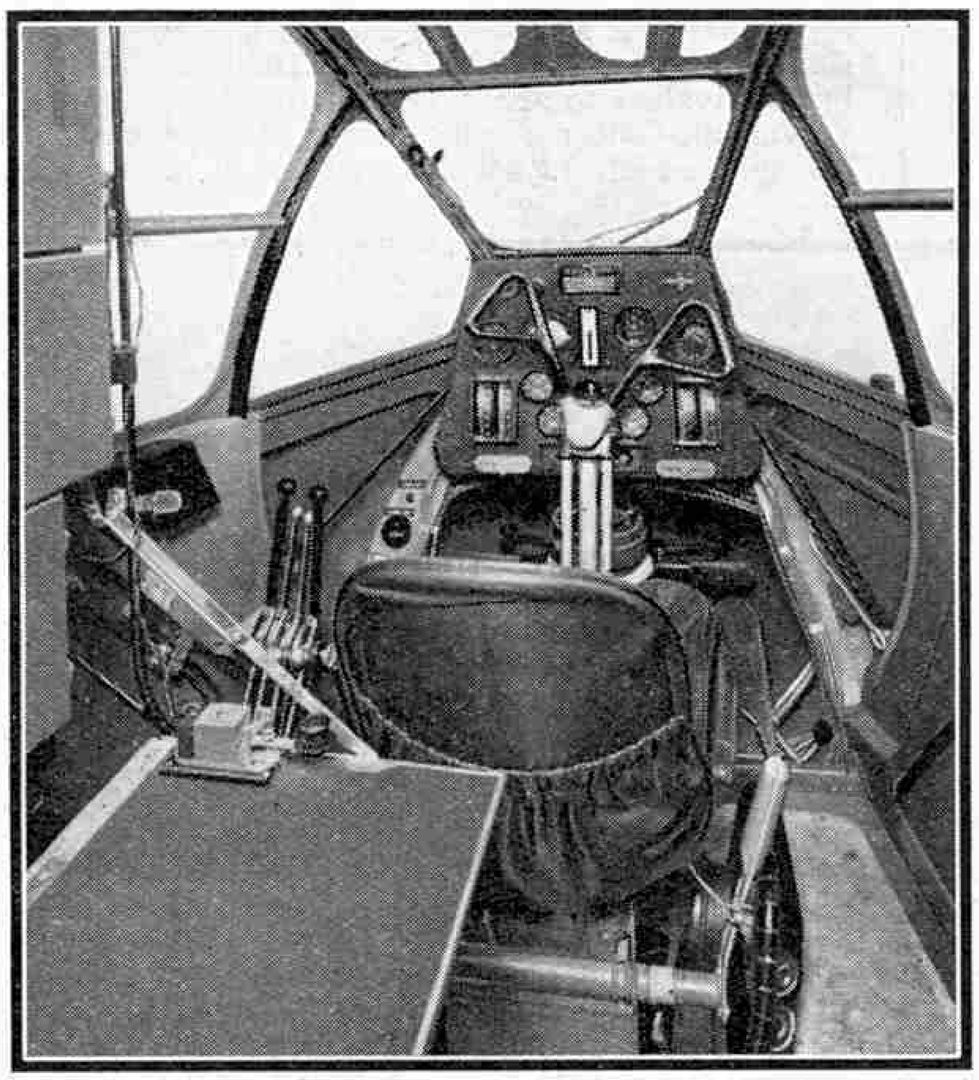
An illustrated article dealing with the machine that has been selected for the Singapore-Brisbane section of the service is published on page 970 of this issue.

The Fastest Four-Engined Air Liner

For Australian Empire Air Mail Service

THE history of Imperial Airways shows that the increase in popularity of air transport has been directly influenced by the improvements that have been made in the comfort and accommodation for the passengers, and also in the reliability of the engines, and consequent increase in safety. The single-engined machines that were first used for passenger work in the early days quickly gave way to more roomy and safe types employing two engines, and these eventually were replaced by triple-engined machines. The latest aeroplanes that have been built for Imperial Airways, such as the Armstrong Whitworth "Atalanta," the Handley Page "Heracles" and the Short "Scipio" flying boat, are all of the four-engined type. In view of these facts it is only natural that a four-engined liner should have been selected to operate the section of the England-Australian air line between Singapore and Brisbane, which involves a 512-mile crossing of the shark-infested Timor Sea.

The machine that has been chosen for this work is a new de Havilland product that has been given the type-name "Diana," and the story of how it was selected is interesting. When the Australian Commonwealth Government decided to inaugurate the Singapore-Brisbane service, tenders were called for from companies willing to undertake its operation. The requirements provided that the machines to be used should have a cruising speed of not less than 95 m.p.h. for the first two years, and that after this they should be replaced by aeroplanes capable of cruising at speeds of at least 110 m.p.h. If a company intended to employ during the first two years machines capable of cruising at 110 m.p.h., however, they would be allowed to use the same type for the whole period of five years. The aeroplanes were also required to be of the multi-engined type, capable of flying level at an altitude of 2,000 ft. with one engine cut out, and with a cruising range of not less than 600 miles against a head wind of 30 m.p.h.

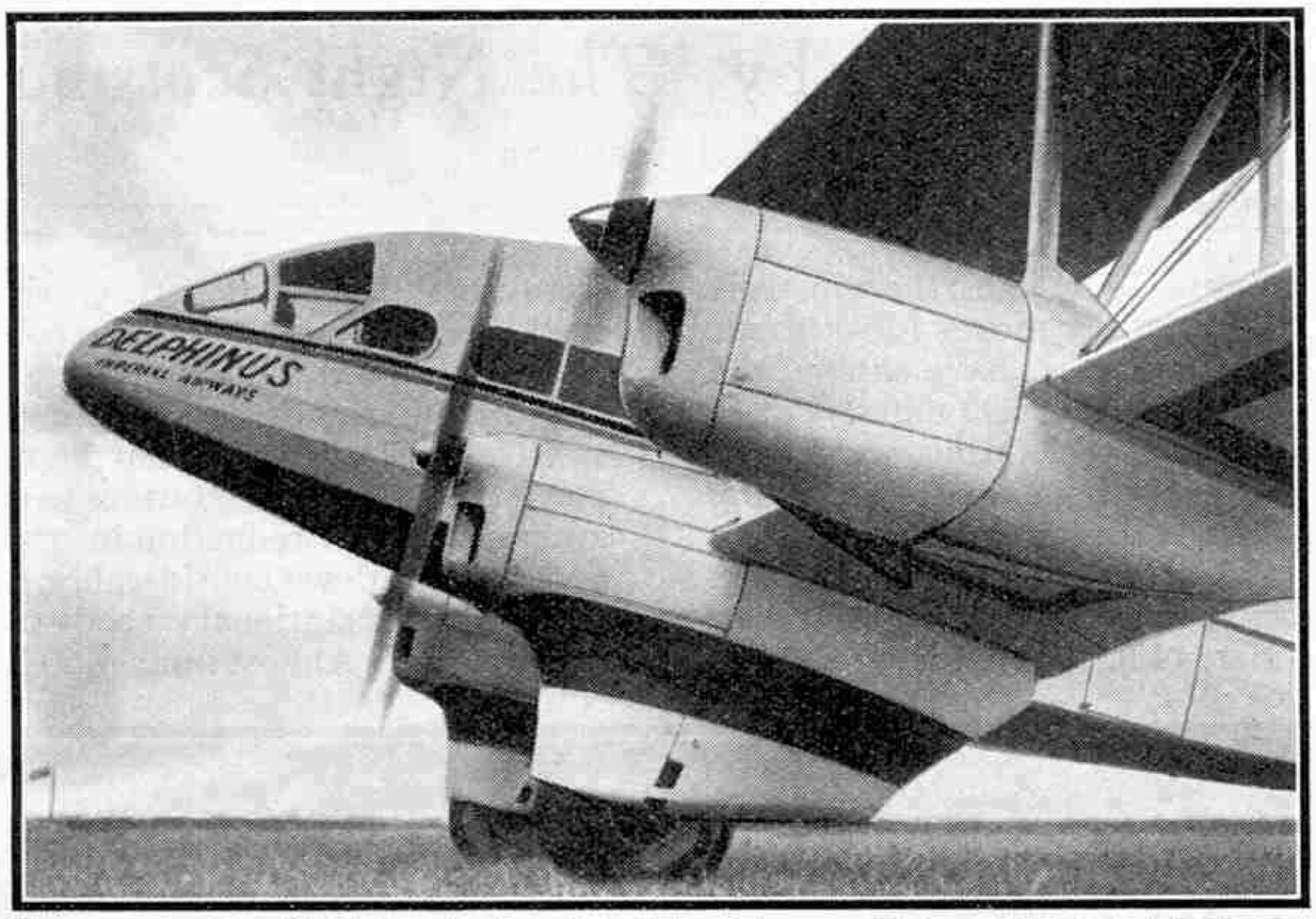


The upper photograph on this page, published by courtesy of "The Aeroplane," shows the first machine of the D.H. "Diana" class. The lower illustration shows the cockpit of a "Diana." This photograph, and the two on the opposite page, are published by courtesy of Imperial Airways Ltd.

At the same time that the conditions of tender were published, the Managing Director of Queensland and Northern Territory Aerial Services Ltd., the well-known Australian air line company whose lines were described in our issue for May 1933, was in England negotiating with Imperial Airways Ltd. for collaboration between the two companies with a view to securing the tender. Qantas Empire Airways was eventually formed as a joint company, consisting of representatives of the English and Australian air line companies, and the directors began to look about for a suitable type of machine. The de Havilland Aircraft Co. Ltd. had been planning a new air liner for some time, and as they were able to state confidently that their machine would not only be capable

of conforming to the Australian requirements but also of exceeding them by a fairly wide margin, one of these machines was ordered.

One of the most important conditions of the Australian Government was that any machine tendered for the service must have received a certificate of airworthiness dated not later than 31st January 1934. The contract for the D.H. machine was not placed until four months before this closing date, when only preliminary sketches had been prepared and every detail of the machine still had to be designed before manufacture could start. In addition, a new engine intended to be used in the machine still had to be perfected and put through the Air Ministry type test. The work of design and production was rushed through with great speed, however, and on 14th January the machine made its first flight. The certificate of airworthiness was eventually obtained on 30th January, one day before the final permissible date!



The nose and engines of "Delphinus," a liner of the "Diana" class owned by Imperial Airways. The shape of the nose differs from that of the one shown on the opposite page owing to alterations that have been made in the layout of the pilot's cabin.

The machine that has been rushed together in this manner is a biplane somewhat similar in general external appearance to the D.H. "Dragon." The pilot, for instance, is carried right in the nose of the fuselage, which is very blunt; while the upper and lower wings are both connected to the fuselage. The "Diana" differs from the "Dragon" in the fact that there are four engines instead of two, all four being carried in nacelles mounted in the leading edge of the lower wing; and also in that the wings are of extremely narrow chord. They are in fact probably narrower than those of any other big biplane built in this country.

When "Gipsy Six" engines are employed, the "Diana" has a top speed of more than 170 m.p.h. and cruises at 145 m.p.h. for a distance of 450 miles when carrying 10 passengers. The worst section of the journey on which the machine is to operate is the crossing of the Timor Sea, and it should be quite capable of this task, for with one engine stopped a height of 15,000 ft. can be maintained even when carrying full load.

Even if two engines on the same side should stop, the machine could still remain in the air with the pilot in full control, and in fact it would be possible to turn against the running engines.

The "Diana" follows modern de Havilland practice in being built almost entirely of wood, and it is the first machine to be produced incorporating a new method of using plywood and spruce. This method has been evolved for the fuselage, which is 43 ft. 11 in. in length and consists primarily of a three-ply box. It differs from most fuselages by the fact that the plywood is inside the box, and the spruce longerons, struts and stringers are outside it. There is then a covering of fabric, and the space between it and the three-ply is filled with special sound-insulating material. The fabric is provided with Zip-fasteners near the control wires at the tail of the fuselage, so that they can easily be examined.

The wings are 44 ft. in span and are of normal construction, consisting of wooden spars and spruce ribs covered with plywood and fabric, although a tubular metal spar is used on the centre section as far as the inner engines. Ailerons are provided on both upper and lower planes, but only the lower ones are connected directly with the controls in the cockpit. They are joined to the upper ones by a streamlined steel tube, and thus when the bottom ones are moved those on top have to move in unison.

The accommodation in the "Diana" can be adapted between wide limits to meet individual requirements. Although dual controls can be arranged if necessary, the machines that have been built for Qantas Empire Airways are provided with only a single set. Behind the pilot is a seat and table for a navigator or radio operator, and the cabin comes next with, in a special long-distance luxury model, armchairs for eight passengers. Behind this is washing accommodation and a luggage hold. Other versions are available with 12 seats and accommodation for passengers' luggage or 14 seats and luggage; while there is also an air ferry model designed to carry 16 passengers.

Side view of "Delphinus" showing the extremely narrow chord of the wing. Although the machine does not look very graceful in this picture, in actual fact it has very beautiful lines when seen in the air.

Northward Ho! by Night

Notes on a Trip by *"The Night Scotsman"*

By S. J. Jackman

PUNCTUALLY to the minute, 10.25 p.m., the whistle is blown and the train imperceptibly moves forward out of King's Cross. A few seconds, and we have entered the first of many tunnels on our journey of 393 miles. Out of this and into another, gradually accelerating, we emerge again, and are passing carriage sidings, and marshalling yards full of activity. Then through many suburban stations not yet closed, and out into the open country. Speed has not become very high yet, as we are ascending the long climb to Potters Bar, 14 miles from King's Cross; but once we have reached the summit of the incline speed is quickly gained and we rush through Hatfield at a fine pace. Onward, past several good class residential centres, and we are through Hitchin, 32 miles, and we catch a fleeting glimpse of rows of engines being coaled, in readiness for to-morrow's work.

We have now reached a rather sparsely populated district, and stations are long distances apart. On this section speed is very high, and the rythmic beat of the carriage wheels is only interrupted by the crossover junctions at each station. Passing the county town of Huntingdon within the hour, we are conscious of a slight reduction of speed as the train is ascending Abbotts Ripton bank. Once over this we are soon travelling at high speed, and shortly pass miles of deep excavations dimly lighted, on both sides of the line, calling our attention to the fact that we are passing the extensive brickworks for which this part of the country is noted.

The brakes are now on and we are crossing the huge bridge over the River Nene to Peterborough, 76 miles. We are not booked to stop, but go cautiously through the station. There is a maze of sidings, and although it is midnight, ceaseless activity exists at this important railway centre. The L.M.S.R. have their lines and sidings on the left-hand side, and the L.N.E.R. on the right.

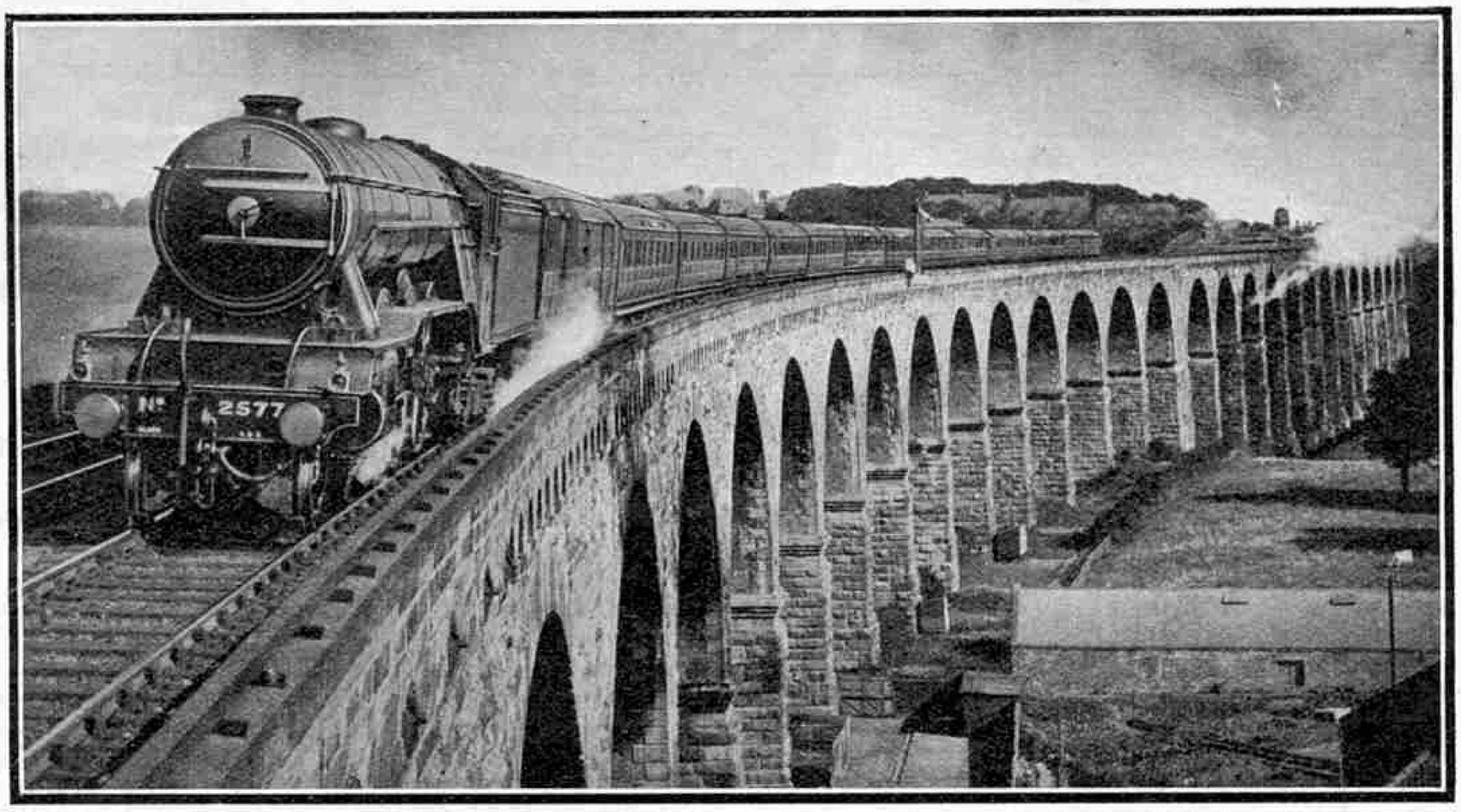
Past brilliantly lighted yards, engines shunting, goods trains arriving and departing, then the large locomotive shed, and we have left Peterborough behind. We have recovered speed rapidly, and as there is a stiff climb ahead of us the driver is taking advantage of the level stretch of line in order that he may start the "bank" in fine fettle. Past more stations now in darkness, and we are aware of a slight reduction in speed. This is a long climb, and slows us down considerably, but we have achieved it, and passing a stationary goods train on our left we enter Stoke tunnel. Almost immediately we increase speed, and by the time we are out of the tunnel we are flying down the long incline to Grantham, 105 miles, our first stop. With a careful manipulation of the brakes we draw into Grantham Station at 12.38 a.m.

An L.N.E.R. night express on the point of departure. The locomotive is one of the famous Gresley "Pacifics" No. 2555 "Centenary." Photograph reproduced by courtesy of the L.N.E.R.

The station seems weird in the dead of night. Our engine goes off, and another comes on, so gently that those sleeping are undisturbed; and at 12.44 a.m. we are away again on the next stage. We quickly speed up, through another tunnel, into the open country past a busy little town, Newark, now hushed in sleep, and over the River Trent by two large and hollow-sounding bridges. Just before the first of these bridges we cross the L.M.S.R. line from Nottingham to Lincoln on the level, and the sound made in crossing is noticeable. This method of crossing is rather unusual, but we shall encounter it again within the next few miles. We are now travelling rapidly, and are shortly over the second crossing at Retford, where the G.C. section from Sheffield to Lincoln is crossed also on the level. Passing the station at high speed, we continue to travel through agricultural land and past small wayside stations, noticed only by the change in the running sound.

Within a few minutes we see on our left-hand side lights beginning to appear and to multiply rapidly, and we are passing the huge marshalling yards at Doncaster. On both sides of the line is a bewildering array of lines, trucks, and engines, all doing the work allotted to them without

confusion. Past the large locomotive sheds on our right, the Works on our left, alongside the station, and we are through Doncaster, 156 miles. We have barely time to glance at this busy junction before we have crossed the River Don and are again in the darkness. Rapidly accelerating, we notice away to our left the lights of collieries, and the sky constantly glares as truck loads of molten slag are tipped on to the huge mounds at the works in this area. Through four small road-side stations, and we notice a slackening of speed, while lights in the distance tell us that we are approaching another large town. There is a severe curve through Selby, and we may just notice the lights of ships as we cross the Yorkshire Ouse by a swing bridge. After a short distance more at high speed we arrive at York and come to a stand in the fine station, having accomplished 188 miles of our journey.

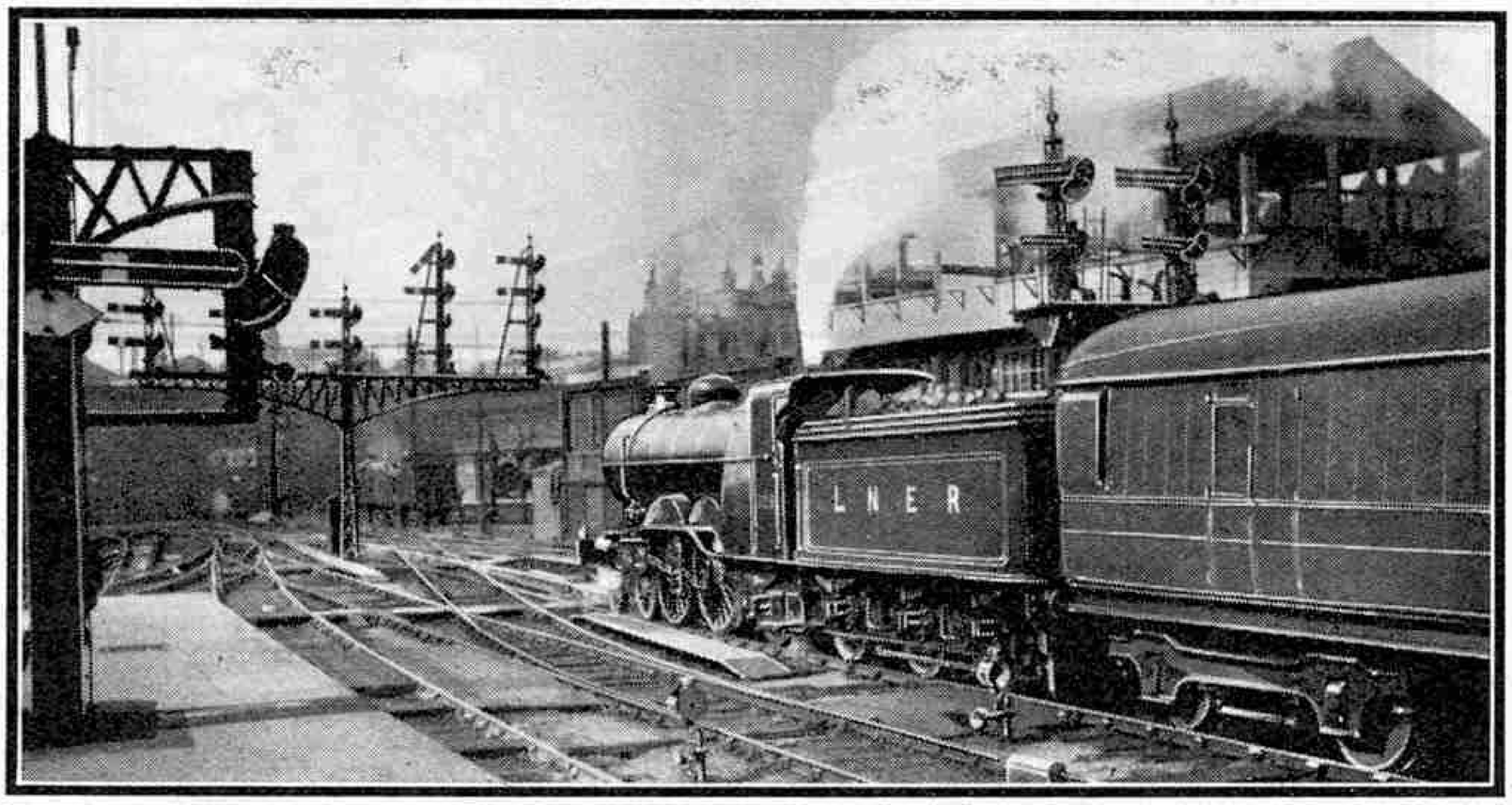


L.N.E.R. "Pacific" No. 2577 "Night Hawk" crossing the Royal Border Bridge at Berwick. This bridge, opened in 1850, consists of 28 arches and has a length of 2,160 ft.

The station has a ghostly appearance at this time in the morning, 2.30, and smells strongly of fish. The shunting going on is done with as little noise as possible, every consideration being shown for the sleeping passengers. If we are sufficiently wide awake we take a stretch on the platform, and notice how raw the air seems. The engines are changed, we return to our warm compartment, and settle down snugly for the next stage. To the minute, 2.40 a.m., the train quietly leaves York, and gets into its stride very rapidly. We pass the locomotive depot and shunting yards on our left, and enter on a flat and uninteresting part of the journey, but as it is dark we are not conscious of the fact. A few minutes from York our other half, "*The Night Scotsman*" from Edinburgh, passes us. On we go, passing station after station at 60 m.p.h., and we reach the half-way point.

Over the River Tees Yorkshire is left behind, and we have now entered the county of Durham, with its coal mines and many industries. Soon we reach Darlington. We are not booked to stop at this interesting town, but go through the station at a reduced speed and can just get a glimpse of the ancient locomotives that have been preserved. They can be seen about half way through the station, on the right-hand side just beyond the buffer stops. Speed is not very great here on account of colliery workings, but all allowance is made for this, and we shall easily recover any losses that may be caused by reducing our speed in places on this account.

A run of about 25 minutes brings us to Durham, and we pass through part of the town on an immensely high viaduct, speed being considerably reduced. If it happens to be moonlight, we obtain a view of the cathedral situated high up on our right-hand side. There is a good view of the town from the railway. We continue still rather cautiously, and in another 20 minutes cross the River Tyne by the High Level Bridge and run into Newcastle Central Station, 268 miles, at 4.18 a.m. The approach to this city by night is weird in the extreme. Huge works, fully active, and blast furnaces fill the sky with a lurid glare. To our right, when crossing the bridge, we see the fine and lofty new road bridge, well lighted, and the lights alongside the river speak of the size and importance of Newcastle. The station, like York, is full of activity, Huge piles of parcels traffic are being loaded into trains; shunting engines are taking a carriage off here and attaching it there; and all with a minimum of noise.



Leaving King's Cross. The locomotive is L.N.E.R. No. 3251, the first of the large-boilered G.N.R. "Atlantics," which have performed such an amount of hard main line work during their careers. Photograph by C. Crocker of Letchworth, Herts.

We leave Newcastle at 4.26 a.m. having changed engines for the last time. The new engine quickly gets away, and we travel through (*Continued on page 979*)

L.M.S.R. Locomotive News

The new two-cylinder 4–6–0 mixed-traffic locomotives with tapered boilers continue to be delivered by the Vulcan Foundry Limited and nearly 40 are now at work. They have been apportioned between the Northern, Midland and Western divisions and are acquitting themselves admirably on all kinds of traffic. Although their driving wheels measure only 6 ft. in diameter, they have shown themselves capable of very swift running in express working, readily attaining maximum speeds of more than 75 m.p.h., and keeping time with heavy loads on fast schedules.

Before being sent to the Northern Division No. 5020 was employed between Crewe and London on clearance tests on various branch lines. Nos. 5032, 5033 and 5034 are stationed at Northampton (W5) shed. Nos. 5030 and 5031 are the first engines of this type to be allotted to the Midland Division, the former being at Kentish Town and the latter at Nottingham. No. 5031 has occasionally appeared on the *"Thames–Forth Express"* between Nottingham and St. Pancras, and No. 5030 has been engaged principally on expresses between St. Pancras and Leicester and vice versa.

New standard 4–6–0s of both the two-cylinder and three-cylinder varieties are now appearing on the North Wales Coast sections, although none at present are actually allotted to Coast sheds, but work through from Crewe, Edge Hill and other depots.

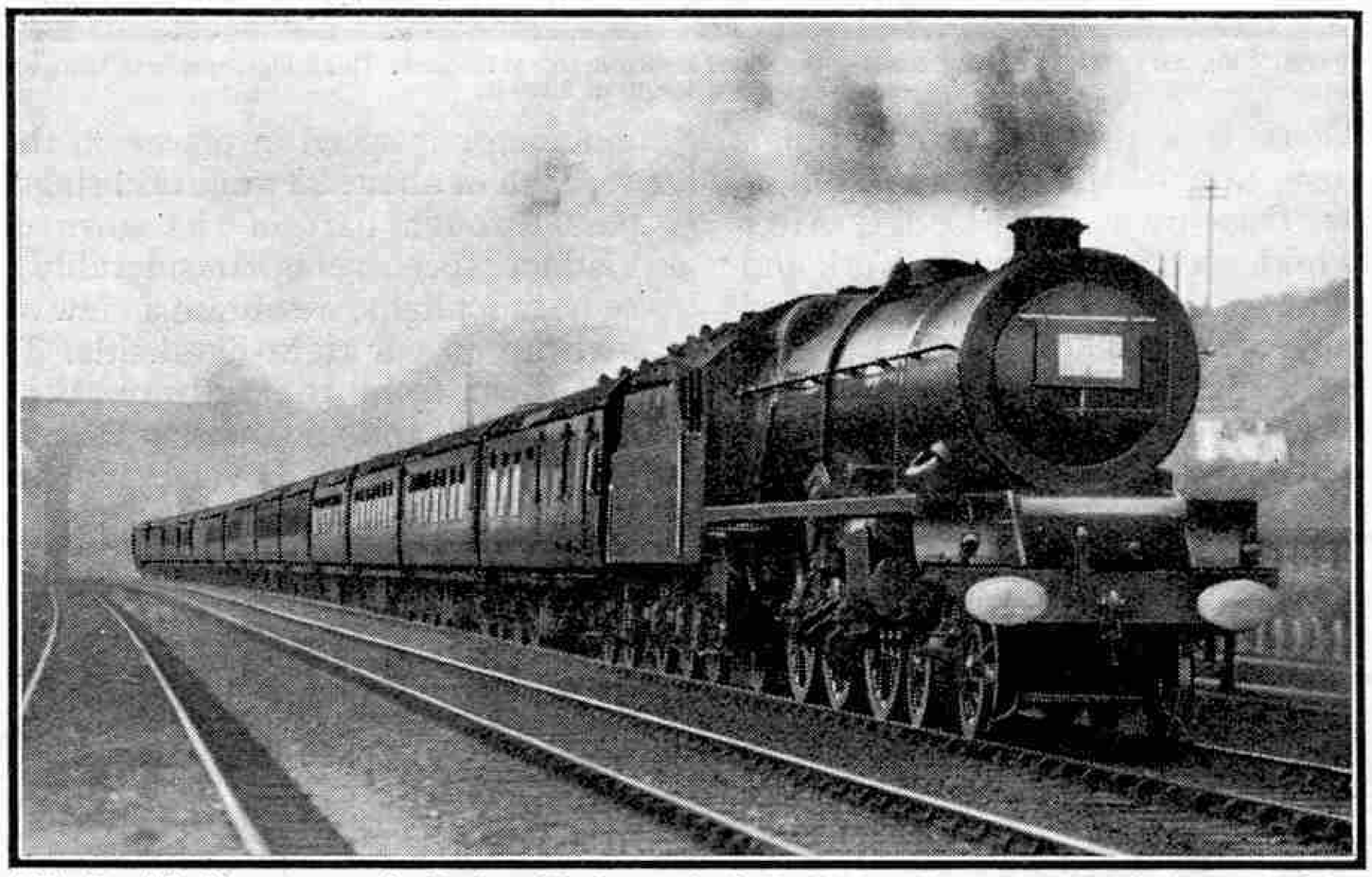
New three-cylinder 4–6–0 "Baby Scots" turned out from Crewe works are numbered 5618 to 5626. These have the smaller tenders carrying 3,500 gallons of water, but their side sheets are rounded inward at the top, similar to those on the larger tenders with a capacity of 4,000 gallons.

For the Northern Counties Committee lines of the L.M.S.R. in Ireland, two 2–6–0 locomotives have been built in the Belfast shops. They are numbered 94 and 95 and are similar to the four engines built recently at Derby for the N.C.C. Their cabs are of modified form, however, and No. 95 carries a chimney of the standard Stanier pattern and has a "jumper" blast pipe.

Derby works are still turning out standard three-cylinder 2–6–4 tank engines, the latest to be completed being No. 2521.

Among recent withdrawals the most notable is that of the 2–4–0 engine No. 25001, *"Snowdon,"* the last of the famous L.N.W.R. "Precedents" to remain at work. Built at Crewe in 1875 it had put in nearly 60 years service. Its last location was at Penrith, where it was employed on local services. Its L.N.W.R. number was 2191, but this was changed to 5001 when the L.M.S.R. was formed, the further 20,000 being added in the renumbering scheme earlier in this year. Another engine of this class, *"Hardwicke,"* which distinguished itself in the Railway Race of 1895, is preserved at Crewe as a historic relic.

Three more "Claughtons" withdrawn are No. 5913, *"Colonel Lockwood"*; No. 5919, *"Lord Kitchener"*; and No. 6014, which had no name. Three further "Princes"—Nos. 5778, 25621, *"Thomas Moore,"* and 25703—and two more L. & Y. 4–6–0s—Nos. 10426 and 10434—also have been sent to the scrap heap. The 0–6–0 engine, No. 22929, previously withdrawn, has been returned to stock.



"The Royal Scot" express passing Bushey. The locomotive is No. 6201, "Princess Elizabeth," the second of the L.M.S.R. 4-6-2 class to be built. Photograph by Railway Photographs, Liverpool.

New Snow Ploughs for L.M.S.R.

The L.M.S.R. are to provide 24 new engine snow ploughs for use on mountainous and exposed sections of the system, largely in replacement of obsolete equipment.

Locomotive Building at Swindon

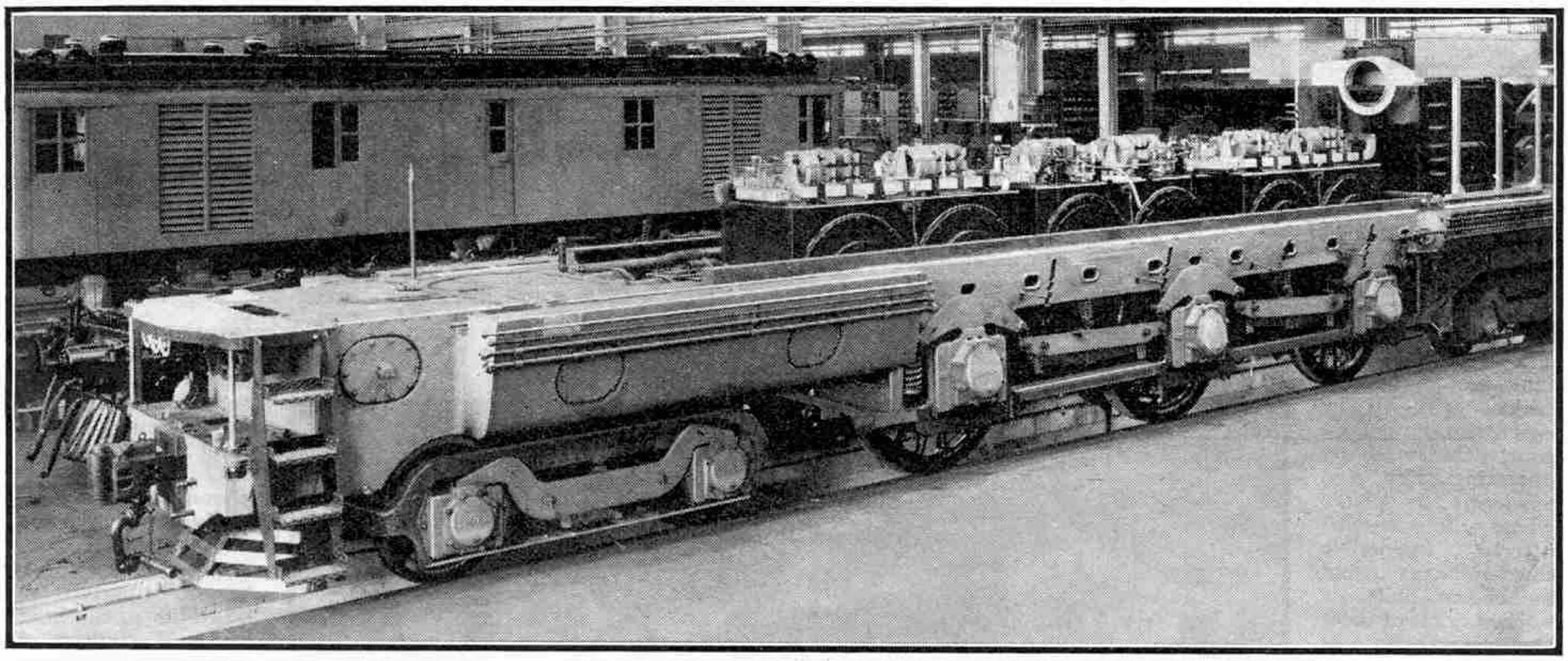
The conversion of the 20 tank engines of the 2–8–0 wheel classification into 2–8–2s with a larger coal and water capacity has now been completed at Swindon, and most of the engines are already engaged on main line freight train service for which the alterations have fitted them. As stated in the *"M.M."* for October last, their new numbers are 7200 to 7219, but formerly they were numbered from 5275 upwards. As altered they are the longest tank engines on the G.W.R., measuring 44 ft. 10 in. over buffers. Each reconstructed engine weighs in working order 92 tons 12 cwt.

A start has been made on a new lot of 30 tank engines of the 0–6–0 type that are similar in all ways to the "8700" series. The new engines will be numbered 9720 to 9749. It is expected that the first 10 will be finished by the end of December.

A batch of 10 standard 4–6–0 locomotives of the "Hall" class will be put in hand shortly, and the following names have been chosen for these engines: 5941, *"Campion Hall"*; 5942, *"Doldowlad Hall"*; 5943, *"Elmdon Hall"*; 5944, *"Ickenham Hall"*; 5945, *"Leckhampton Hall"*; 5946, *"Marwell Hall"*; 5947, *"St. Benet's Hall"*; 5948, *"Siddington Hall"*; 5949, *"Trematon Hall"*; and 5950, *"Wardley Hall."* Already 120 locomotives of this class are in service and are being employed on a wide variety of duties on all parts of the line.

Isle of Wight Railways

Great improvements have been made in the railways of the Isle of Wight since they came into the Southern Railway system. The locomotives now in use are much more powerful and efficient than those formerly employed and modern bogie coaches are gradually superseding the old four-wheeled stock that was used on passenger trains. Most of the chief services in the Island are now operated by trains that are composed exclusively of bogie stock and afford greatly increased comfort to all who travel in them.



Locomotive Experiments and Speeding-up

Mr. H. N. Gresley, C.B.E., Chief Mechanical Engineer of the L.N.E.R., in his recent Presidential address, delivered at the Institute of Mechanical Engineers in London, renewed a plea that he had made formerly for the establishment of a national locomotive experimental and testing station. He said that there was urgent need for the provision of facilities for the scientific study of the locomotive in operation and that if such a station were constructed economies in fuel consumption and improvements in the design of locomotives could be effected. At Vitry, near Paris, an experimental station perfectly equipped for carrying out analytical and scientific research into the working of the railway locomotive had been opened last year, but in England there was only the small testing plant installed at the G.W.R. Swindon works 30 years ago. A scheme to provide an up-to-date testing plant had been approved, but difficulty was encountered in financing the plan.

Mr. Gresley also spoke of the tendency towards the speeding-up of all trains to-day and referred to the widespread provision on the Continent and in America of Diesel-electric and other high-speed units. He said that the question was naturally asked why nothing had been done in Great Britain, beyond speeding up the existing steam-operated trains. The answer of course was the difficulty of finding on our congested railways a path for trains of such exceptional speeds, and Mr. Gresley said, "I think that the day is not far distant when heavy trains, consisting of one class only, will be run at speeds not less than the best speeds of to-day, and that short extra-high-speed trains, for which a supplement will be charged, will be introduced."

The upper illustration, reproduced by courtesy of the General Electric Company of New York, shows a 4-6-4 electric locomotive for the Pennsylvania Railroad in course of construction, with the underframe, transformer and motors assembled. For the lower photograph of the electric "Brighton Belle," a Pullman train that is unique among British expresses, we are indebted to the courtesy of the Southern Railway.

Record Runs in America

Two railway runs that seem to be records for America have lately been made, one by a steam-drawn train and the other by a Diesel-electric streamlined flier. The first run was made between Chicago and Milwaukee and the distance of 85 miles was covered in 67 min. 35 sec., start to stop, giving an average of 75½ m.p.h. Within the limits of the two cities named, however, any speeding was out of the question because of level-crossings and other restricting factors, and it was only when well clear of the cities that the real racing could be done. From Mayfair, 9 miles from Chicago, passed at speed, to Lake Wisconsin, also passed at speed, the 68.74 miles were done in 45 min. 53 sec., showing an average of 89.89 m.p.h. For 25 miles an average of 93½ m.p.h. was sustained and for more than 11 miles the average was 95¼ m.p.h. It is said that the maximum attained was 103.5 m.p.h. The engine was No. 6402, of the 4–6–4 "Baltic" type, having 6 ft. 7 in. driving wheels, and a huge boiler with over 6,000 sq. ft. of heating surface. The train was made up of five coaches, weighing 365 tons.

The Union Pacific Diesel-electric train, composed of six luxurious aluminium coaches, covered a much longer distance, and travelled from Los Angeles on the Pacific coast to New York, covering the 3,334 miles in 56 hours 56 min., as compared with 84 hours usually taken for the journey.

From Los Angeles to Chicago, including the crossing of the "Rockies," the average speed for the 2,364 miles was 60.6 m.p.h. while for over 500 miles the average was 84 m.p.h. For two miles a top speed of 120 m.p.h. was registered. From Chicago to New York the schedule observed was that of the *"Twentieth Century Limited"* and this reduced the overall average to 59 m.p.h. The run was made as an experiment in preparation for a regular service that is to be instituted early next year.

New L.N.E.R. "Mikado" At Work

The second of the new 2–8–2 "Mikado" express locomotives to be completed at Doncaster works is No. 2002, and carries the name *"Earl Marischal."* It has piston valves worked by Walschaerts gear instead of rotary cam poppet valves as fitted to No. 2001 *"Cock o' the North,"* and comparative tests are to be carried out. After leaving the works, No. 2002 was stationed for several weeks at Doncaster and made a series of trial runs, chiefly on slow trains. The new engine has visited King's Cross several times. On Thursday, 8th November, it arrived there a minute early with the fast and heavy express due at 1.55 p.m., although Doncaster had been left nine minutes late. It returned with the 4 p.m. express that same afternoon.

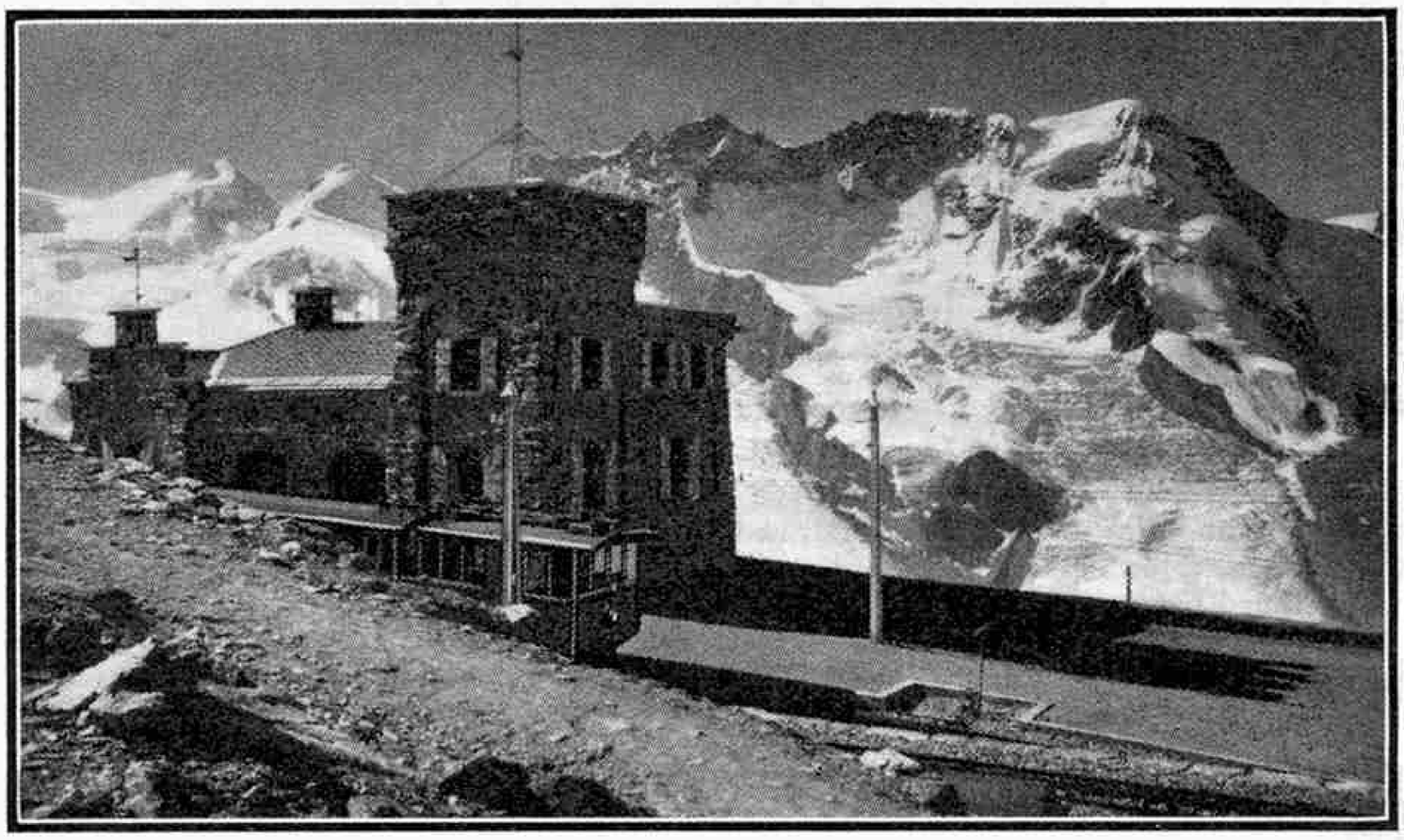
No. 2001 is going to France for special tests at the experimental station at Vitry.

The Railways of Switzerland

III.—Mountaineering by Rail

By "Observer"

AMONG the many triumphs achieved by Swiss engineers, perhaps the most astonishing are to be found in the wonderful mountain railways which, with daring enterprise, have been constructed, and are operating safely and efficiently, in places where it seemed utterly impossible that railways could be either built or worked. Some of these lines scale the face of seemingly inaccessible heights and attain to amazing altitudes. From Zermatt, the Gornergrat line climbs to over 10,000 ft. above sea-level; and even this is surpassed by the Jungfrau Railway, which achieves a height of more than 11,000 ft.



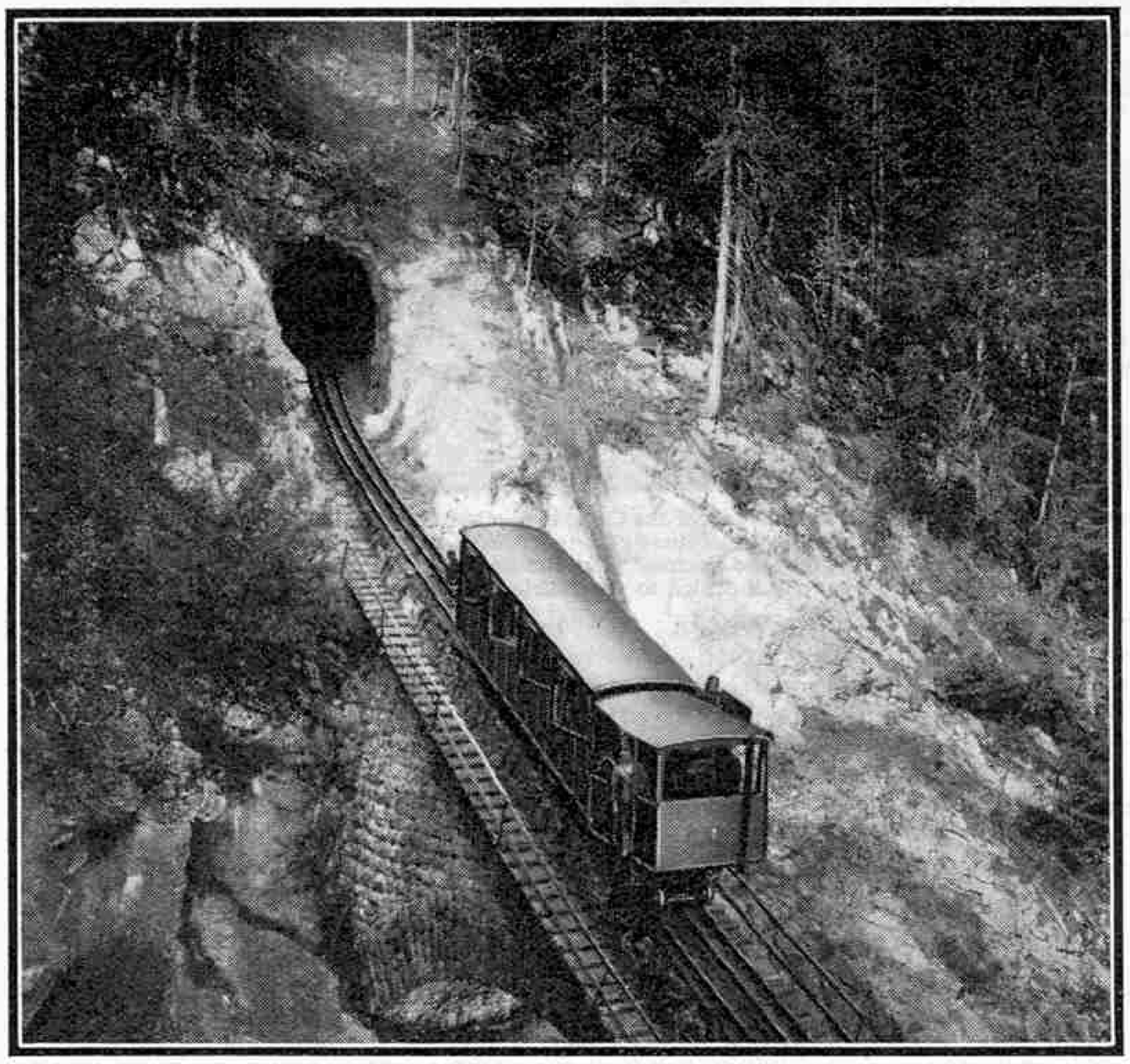
The Gornergrat station, 10,140 ft. above sea level. This and the other illustrations to this article are reproduced by courtesy of the Swiss Federal Railways.

Some of the mountain railways are of considerable length and traverse regions of marvellous beauty and engrossing interest. Among these may be mentioned the Bernina, Rhaetian and Furka-Oberalp Railways, and the line from Brigue via Visp to Zermatt. These are all metre gauge railways, with many formidable gradients, and worked in places on the rack-and-pinion system.

Other railways have been built for the specific purpose of ascending particular peaks and enabling visitors to reach famous view-points or engage in the sports that may be enjoyed on Alpine heights. Of such, the railways up the Rigi, Pilatus, Niesen and Rothorn are well-known examples. These mountain railways are of various gauges and are operated by different methods. Some are funicular, or cable, railways, while others have the rack-and-pinion system; and although many are worked by electric power, there are still some in which steam is the motive agent. Of purely rack-and-pinion lines there are 15 now in operation in Switzerland, and 13 other lines where rack working is employed only on the steepest sections, ordinary adhesion methods being used on the easier portions. There are also 52 "funiculars," including one that claims to be the steepest railway in the world. It is situated at Piotta, on the St. Gotthard route, and ascends to Piora, rising 2,145 ft. in $\frac{7}{8}$ mile, the maximum gradient being slightly steeper than one in $1\frac{1}{4}$!

Another extraordinary form of transport provided in the Alps is that of the wire-rope aerial suspension line. Of this type of railway there is at present only one actually operating in Switzerland. It runs from Gerschnialp up to Trübsee, near Engelberg. Formerly there was a line of this kind up the Wetterhorn at Grindelwald. The remains of it may still be seen, but damage caused by avalanches resulted in its being closed. In the French Alps, in the neighbourhood of Mont Blanc and Chamonix there are several of these suspension railways, one of which has a swing, without any intervening support, of 4,430 ft.

The first rack-rail mountain railway to be built in Europe was that up the Rigi, the massive ridge of mountains situated between the lakes of Lucerne, Zug and Lowerz. This was opened in 1871, and runs from Vitznau, at the base of the mountain, on the shores of Lake Lucerne, and pursues a winding course up the mountain side until the Kulm is reached at an altitude of 5,905 ft. The length of the line is 4.38 miles and its maximum gradient 1 in 5. Steam traction is employed, the locomotives being specially designed with a central cogwheel that works on a rack laid between the rails. The average speed is about 5 m.p.h. and the engine is located, as is customary on all extremely steep railways, at the lower end of the passenger coach. The views obtained both from the summit and during the journey are of great splendour. Another railway, using electric power, has more recently been constructed up the other side of the Rigi, starting from Arth-Goldau, an important junction, where connections are given with the St. Gotthard and other routes.



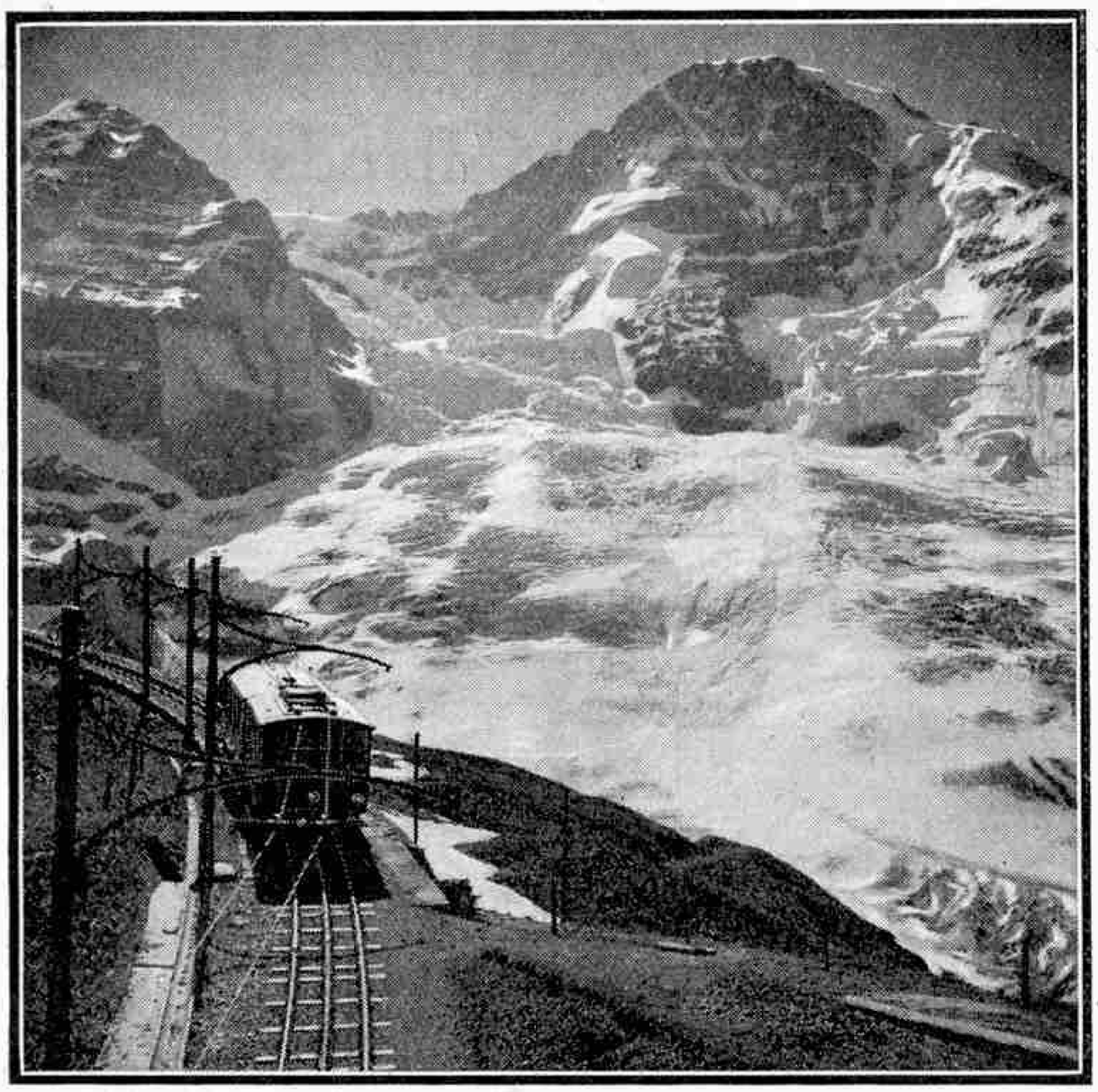
Emerging from a tunnel on to the Wolfort Viaduct on the Pilatus rack railway. The steam coach shown is of special construction in view of the severe gradients.

Probably the most popular of the Swiss mountain railways is the one up Mount Pilatus, which was finished in 1888. This is a shorter but much steeper line than the Rigi. It starts from Alpnachstad on the Lake of Lucerne, and in

rather less than 3 miles climbs 5,344 ft. and attains to the Pilatus-Kulm station, 6,791 ft. above the level of the sea. The maximum gradient is 1 in 2, the average 1 in 3, and the easiest 1 in 5. There are several tunnels, and the permanent way is extraordinarily strong and solid. The rails are secured to huge granite blocks cemented in the mountain side, construction of this nature being necessary to provide against the tendency rails would have to slide down if laid at such an acute inclination on ordinary sleepers, especially when trains were ascending or descending. For the sure control of the train on its descent, and as a precaution in case of mishap, no less than four separate systems of braking are provided.

Owing to the abnormally steep gradients a specially-devised form of rack-rail is employed, having teeth, not on the upper edge as is usual, but on both of its sides, into which horizontal cogged wheels fitted to the locomotive engage.

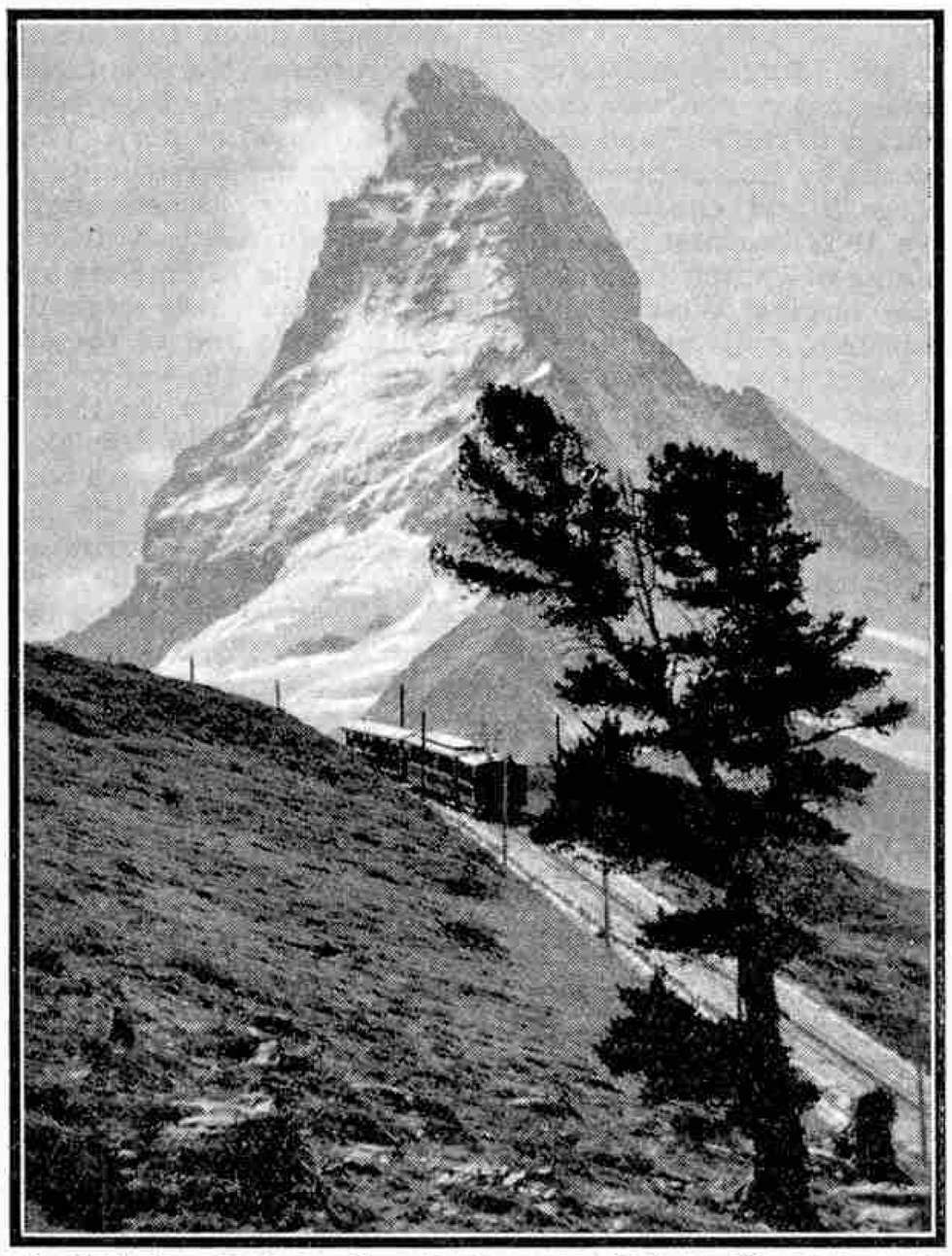
Another remarkable mountain railway, that up the Jungfrau, near Interlaken, has the distinction of being the highest railway in Europe. It mounts to an altitude of 11,342 ft. and takes the wondering traveller well up towards the summit of that noble peak. This railway took 14 years to build, and lies for the greater part of its length in the interior of the mighty snow-clad Alps. One great advantage gained by thus tunnelling through the rock is that protection is thereby provided for the track against avalanches and landslides. The lower terminus of the Jungfrau line is at Kleine Schiedegg, 6,770 ft. above the sea, which can be reached by the railways that climb thither from both Lauterbrunnen and Grindelwald.



A striking view on the way to Jungfraujoch, giving a good idea of the remarkable scenery visible from the mountain railways of Switzerland.

The first stage, the 1¼ miles to Eiger Glacier station, is mostly in the open and comparatively easy, with a gradient of 1 in 8. Beyond that the line goes up for much of the way at an inclination of 1 in 4 through the tunnel that was cut out laboriously by means of electric drills in the hard limestone rock. The bore is 10 ft. wide and 14 ft. 3 in. high, and has a semi-circular roof. It is lighted throughout, and the trains, which are electrically propelled, take about 20 min. to pass through it. There are intermediate stations at Eigerwand and Eismeer, and these also are part of the tunnel, enlarged to form a hall in each case and to give all necessary accommodation. The upper terminus is at Jungfraujoch station, and this again is hewn out of the solid rock and has large plate-glass windows through which an enthralling panorama may be seen.

Among the longer journeys that can be made by mountain railways in Switzerland, one of the most pleasurable is to travel from Brigue through Visp to Zermatt, and then to go forward over the yet steeper line to the Gornergrat. Although the line from Brigue to Zermatt is laid to the metre gauge, the modern rolling stock is surprisingly spacious and comfortable. The first-class is up to the best "Pullman" standard and the second-class is quite luxurious. In both, the wood-work, metal-work and upholstery are exceedingly tasteful and attractive, and the large frameless windows make observation of the scenery delightfully easy. The third-class coaches are also excellent, but like most Swiss "thirds" have no cushions.



The Matterhorn Peak seen from the Gornergrat Railway. This photograph shows the pyramidal form of this remarkable mountain.

After leaving Brigue the line runs for 5½ miles along the bottom of the Rhone Valley, side by side with the standard-gauge lines of the Swiss Federal Railways; while on the hillside on the right the Lötschberg line can be seen steadily ascending. At Visp, the Zermatt line turns away to the left and enters upon the arduous ascent of the Visp and St. Nicholas valleys, which are famed for the rare magnificence of their scenery. For mile after mile the railway keeps close to the foaming torrent of the Visp, and at different stages of the journey an imposing succession of giant peaks may be seen, until at length, as the train curves round just before Zermatt is reached, the peerless pyramid of the Matterhorn breaks into view. The valley is particularly grand and impressive in the neighbourhood of Stalden where it forks, the left hand branch going up to the much-favoured resort of Saas Fee.

This Visp-Zermatt line is now operated by electric traction, separate locomotives being employed; but previously steam was used, and some traces of the former method still remain in the form of disused hydrants and other provision for steam locomotives. Of the 21¾ miles between Visp and Zermatt, 4⅝ have to be worked by rack-and-pinion, the steepest gradient being 1 in 8. On the sections worked by ordinary adhesion, the maximum rise is at 1 in 40. Altogether the line ascends from 2,140 ft. at Visp to 5,315 ft. above sea level at Zermatt. The speed on the rack sections ranges from 8½ to 12½ m.p.h., while on favourable stretches of the ordinary sections as much as 28 m.p.h. may be reached. The time taken for the 27¼ miles from Brigue to Zermatt, including stops, is 1 hr. 50 min.

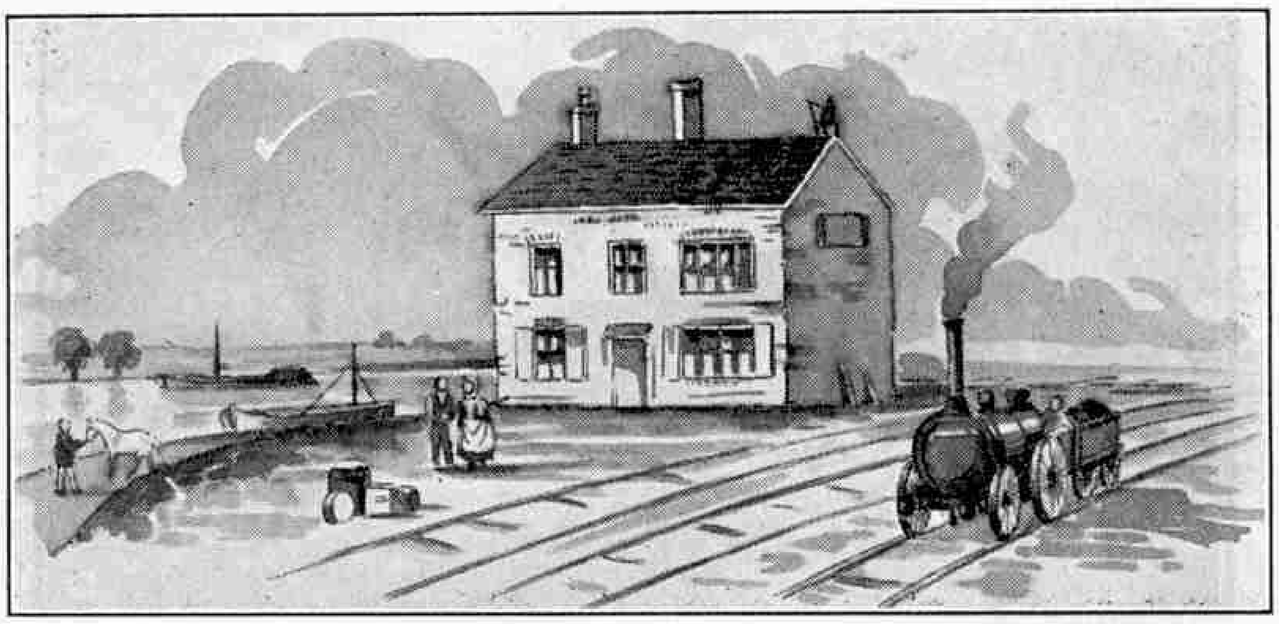
From Zermatt, that incomparable Alpine mountaineering centre, the journey is continued in an electric narrow-gauge train, operated on the rack-and-pinion system, that climbs resolutely for six miles to the summit at the Gornergrat, 10,140 ft. above sea-level, the maximum gradient being 1 in 5 and the time taken 1¼ hr. Although this altitude is rather less than that attained by the Jungfrau line, yet for the Gornergrat railway it is claimed that it is the highest open-air railway in Europe, because except for a few short tunnels the line is in the open all the way.

Just above Zermatt the train passes over a fine viaduct thrown across the deep gorge of the Findelen, and proceeds through larch woods and grassy slopes, gay with a gorgeous profusion of Alpine flowers, to the first intermediate station at Riffelalp. In the higher stages beyond Riffelberg, after the tree line has been passed, vegetation becomes more and more scanty, until before the summit is reached, a region of perpetual snow and ice has been entered. At the summit one gazes spellbound on more than 50 glaciers and a seemingly countless array of mighty peaks.

Leicester and Swannington Railway

The Pioneer Midlands Line

ALL "*M.M.*" readers know that the present railway system of Great Britain has been built up by a process of amalgamation. The great groups of to-day were formed in 1923 by the fusion of previously independent companies which, with a few exceptions, had themselves developed as the result of amalgamations that took place fairly early in railway history. Of the early lines that were destined to lead up to and form part of important trunk routes, the Leicester and Swannington Railway is a good example. It was laid down to secure the cheap transport of coal from the Leicestershire mines to the districts round the county town. Canal transport previously had been used, but after the Charnwood Forest Canal burst its banks in 1799 it was never repaired. Thus, as was the case with many of the early railways, coal was the primary reason for the existence of the Leicester and Swannington line.



The original station at West Bridge, Leicester. This was the terminus of the Leicester and Swannington Railway, the first part of which was opened in July 1832.

It was the first steam railway in the Midland counties, and formed the oldest constituent part of the pre-group Midland Railway whose simple title gave little idea of the actual extent of the system. The Midland was indeed a line of wide interests, stretching from London to Carlisle; while in addition its engines could be seen at places as far apart as Bristol, Liverpool, York and Southend.

Although quite a small concern—it was only 16 miles long—and originally isolated, the Leicester and Swannington Railway had many points of interest, apart from its relation to the Midland and thus to the present L.M.S.R. It was engineered by Robert Stephenson under the supervision of "old George," and construction actually started in October 1830. In July 1832 the first portion of the line was formally opened to the ringing of church bells and the firing of cannon. The first train left the original West Bridge station at Leicester and ran as far as Bagworth, a distance of 10 miles. It was drawn by the locomotive "*Comet*," which thus was the first locomotive to run in the Midlands; and George Stephenson himself acted as driver on the occasion. The engine had been built by Robert Stephenson and Company at Newcastle-on-Tyne, and to get to the Leicester and Swannington Railway it had to be transported by sea from Newcastle to Hull, and thence by canal.

An exciting incident of this inaugural trip was that during the passing of Glenfield Tunnel the chimney of the engine was damaged by coming into contact with the tunnel. After a temporary stoppage the trip was resumed, and the return journey from Bagworth was duly completed after the party had had the usual lunch. Ordinary traffic commenced the same day, but the portion of the line from Bagworth to Swannington was not opened until 1833.

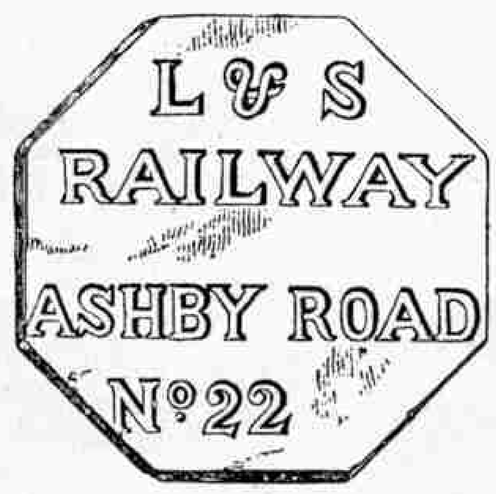
This Bagworth-Swannington portion is interesting in that it involved two inclines that were not worked by locomotive power. Bagworth incline was 43 chains in length on a gradient of 1 in 29, ascending in the direction of Leicester and therefore in favour of the loads from the collieries. It was worked on the self-acting principle, whereby the loaded vehicles descending drew up the ascending empties by means of a rope. At first passengers also were rope-hauled up the incline, but after a mishap in 1843 they had to walk up!

The other incline, at the Swannington end of the line, about half a mile long on a gradient of 1 in 17, was against the direction of the loads. It was therefore worked by a stationary steam engine which, remarkable to relate, is still in use after a century of working. This veteran machine was constructed in 1833 by the Horsley (Coal and Iron) Company of West Bromwich, and although it seems to have given some trouble in its early days, it has certainly given good service. It is highly prized as a relic by its present owners, the L.M.S.R. The illustration on the next page shows the general appearance of the engine to-day. It is a long-stroke, simple expansion, single cylinder engine, the cylinder diameter being 18¼ in. and the stroke of its piston 3 ft. 6 in.

A most interesting feature of its design is the valve and valve gear. The valve is of the circular piston type, and must be a very early example of this form of valve. Its movement is obtained from what is known as "gab" motion, the eccentric rod not being permanently connected to the valve gear. It is formed with a slot at its loose end, however, which can engage with a pin fitted to a short lever or link forming part of the valve gear. The method of operation is for the engineman to move the valve by hand, by means of the double handle shown in the illustration, until the engine is working properly. Then the slot in the eccentric rod is made to drop over the pin, when the engine continues to run in the ordinary way.

The flywheel is fitted to a massive shaft to which is fixed the winding drum for hauling wagons up and a brake for lowering wagons down the incline. Originally it pulled loads from the collieries up the incline, but now it only draws up the empty wagons that previously have been let down as loads to the pumping plant of a disused colliery. This plant has still to be kept going in order to keep neighbouring pits clear of water.

Another Leicester and Swannington relic of 100 years ago that is still in use is a drawbridge by means of which a branch line crosses the River Soar at Leicester, to gain access to a coal wharf. This branch was originally worked by horse power on account of the bridge and of the sharp curves of the line. A motor tractor running on the ballast now supplies the motive power.



One of the brass tickets used on the Leicester and Swannington Railway.

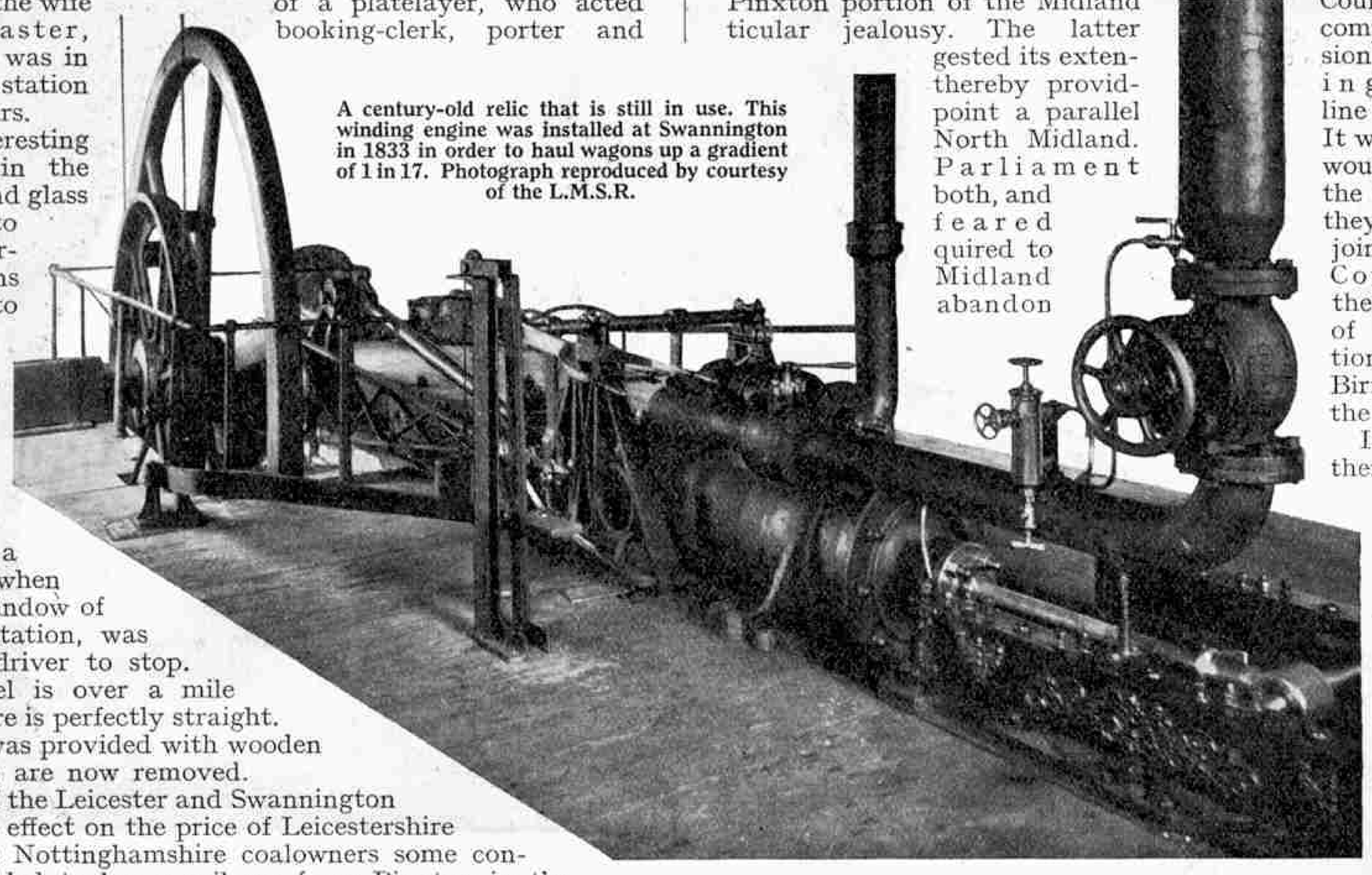
In 1846 this interesting little system was vested in the Midland Railway. That company obtained powers to connect the line with their own system, and this left the Swannington incline as a dead end. A deviation was constructed to avoid the Bagworth incline, and the introduction of other connections had the effect of putting the original West Bridge terminus on a branch line. The original station was in use until 1893, when another one was built on a slightly different site. Passenger traffic gradually diminished, however, and eventually was discontinued in 1928.

The Leicester and Swannington Railway also made some contribution to locomotive history for it was a collision on the original line, at a level crossing, between one of the locomotives and a farm cart that led to the fitting for the first time of a "steam trumpet" or whistle to the engine. Previous to this no warning device had been used, other than a horn similar to those employed on stage coaches.

Ten locomotives in all were owned by the Leicester and Swannington Railway, but only eight were in use at any one time. The "*Comet*" used at the opening of the line was an 0–4–0 of the type first introduced by the makers for the Glasgow and Garnkirk railway. It was soon found too small for the traffic and eventually was sold. Other 0–4–0 engines of greater power were obtained, and two of these were altered to the 0–4–2 wheel arrangement. It was one of these named "Samson" that figured in the collision previously referred to. The first six-coupled engine built by Robert Stephenson and Co. was "*Atlas*" No. 6 of the Leicester and Swannington Railway. As the first engine built with inside cylinders

and six-coupled wheels, it may be regarded as the originator of the standard British goods engine, and was a great advance on previous locomotives at that time.

Among the unusual features of the railway in its early years was the use of passenger tickets made of solid brass, while several of the intermediate "stations" were rooms in hotels where passengers waited for their trains. One of the first employees of a platelayer, who acted on the line was the wife booking-clerk, porter and as station-master, signalman, and was in charge of one station for nearly 40 years.



A century-old relic that is still in use. This winding engine was installed at Swannington in 1833 in order to haul wagons up a gradient of 1 in 17. Photograph reproduced by courtesy of the L.M.S.R.

Another interesting point is that in the early years a sand glass was employed to govern the interval at which trains were allowed to pass into Glenfield Tunnel. Here too a very primitive form of night signalling was employed, consisting of a candle which, when placed in the window of the adjoining station, was a sign to the driver to stop. Glenfield Tunnel is over a mile long and the bore is perfectly straight. At one time it was provided with wooden doors but these are now removed.

The success of the Leicester and Swannington Railway and its effect on the price of Leicestershire coal caused the Nottinghamshire coalowners some concern. They decided to lay a railway from Pinxton in the Erewash Valley to Leicester, for their traffic, which was waterborne to Leicester, was showing a serious decline, and the canal authorities would not agree to a reduction of rates that would have enabled Nottinghamshire coal to compete with Leicestershire in the Leicester market. Hence the promotion of the Midland Counties Railway, which was ultimately projected "to connect the towns of Leicester, Nottingham and Derby with one another," and to include a junction with the London and Birmingham system and a branch to Derbyshire and Nottinghamshire collieries and to Pinxton. This was in 1833 and it was then considered that only a short time would be required for the completion of the work.

But the North Midland Company was in the field to construct a line from Derby to Leeds and also an extension from Derby to Birmingham, and regarded the Erewash Valley or Pinxton portion of the Midland Counties with particular jealousy. The latter company had suggested its extension to Chesterfield, thereby providing to this point a parallel line to that of the North Midland. It was unlikely that Parliament would sanction both, and the North Midland feared they might be required to rejoin up with the Midland Counties, and abandon their original hope of direct connection with Derby, Birmingham and the West.

In face of this, therefore, the influential moneyed men of the North, who had substantially assisted the original Midland Counties subscribers, found that there was a danger of the Midland Counties Bill being rejected unless the Erewash Valley line was omitted. Thus the Pinxton line so desired by the coalowners of Nottinghamshire was abandoned, to the great disgust of the original promoters.

After a period of independent operation, the Midland Counties, the North Midland and the Birmingham and Derby Railway united in 1844 to form the Midland Railway; and in 1848 was absorbed the little Leicester and Swannington line that had really stimulated the construction of the other systems.

Northward Ho! by Night—(*Cont. from page 973*)

many miles of suburbs. Speed increases, and we welcome the rhythm of the wheels again, which was not so marked when travelling through the county of Durham. We shall pass no other really large towns, the remainder of the journey being mostly through agricultural country. Many small roadside stations are passed in quick succession, and unless it is the depth of winter we get a view of the sea away to our right. This is a pleasant stage of the journey, as the sea is visible for most of the distance to Edinburgh.

Crossing the River Tweed by the fine Border Bridge, we leave England behind, and just beyond the bridge we enter Berwick-on-Tweed station, 335 miles, at 5.56 a.m. A brief halt for two minutes, and we are off again. Except in the mid-winter months it is now daylight, and we are treated to some delightful scenery. The train is ascending a long steep bank, and its speed is lowered. On the left is bare moorland, almost mountainous, but on our right the view is charming. We look down at countless little rocky coves, with the sea breaking in, the waves crested with foam; while out at sea a steamer can be seen, apparently motionless.

The engine has now topped the bank and is beginning to increase in speed, and our final tear to Waverley has commenced. There is much activity on the train now; the sleepers are awaking and the guard and train attendants pass and repass as we fly through Dunbar. There are no passengers for North Berwick, so we shall not have to stop at Drem. Speed is high on this part of the journey and the rhythm that has accompanied us during the night is quickened. We get a fine view of the Firth of Forth, and the dim outline of the Fifeshire coast. Still rushing on we pass through Portobello, the seaside suburb of Edinburgh. The brakes are now applied, and we slacken speed considerably, enter tunnels, and eventually draw into the magnificent Waverley Station at 7.15 a.m., dead on time.

Before going on our way we give a look at the grimy locomotive men, and think of how they have been working, particularly the fireman, while we have been enjoying ease and comfort. The locomotive, which so recently was tearing along at 80 m.p.h., is now quietly steaming.

[NOTE: The times mentioned in the article refer to Summer Timetables.]

How to Get More Fun—(*Continued from p. 1023*)

railway owners. It is quite thrilling to see and handle trains in the brightly-lit station or yard, and then despatch them on their respective journeys through the darkened countryside, the red and green signal lights only marking the path they are to follow.

The composition of parcels and similar trains might appear at first to be a simple and not very interesting subject. Actually it can be just the opposite, for although the term "vans" would describe, in a general way, the rolling stock used, the variety and types of vans employed immediately opens up quite a wide subject. In actual practice it is possible that no two vehicles of such a train will be similar. Although on a Hornby railway the range of types of vans is not so wide, yet some quite effective and varied formations can be arranged. The No. 2 Luggage Van will be first choice on a train of this kind, and in contrast to its twin bogie construction the similar but smaller four-wheeled No. 1 Luggage Van may be used as well. The guard of course must not be forgotten, so that a Guard's Van is necessary. If they are available, several of these vans may be included, as they are largely employed for parcels traffic in actual practice.

Among other interesting trains of varied formations of this kind that can be run are those conveying empty milk churns, theatrical specials and empty stock trains. "Milk empties" will require the Hornby Milk Vans, both No. 0 and No. 1, possibly a No. 2 Luggage Van or two, and a Guard's Van. If Milk Tank Wagons are also employed on the line, they too may be included. Theatrical specials, which are essentially Sunday trains, are run for the conveyance of touring companies, together with their effects and properties, from one centre to another. Several Passenger Coaches, a Guard's Van and a No. 2 Luggage Van would be a representative make-up in miniature. Any special properties may necessitate the inclusion of a Flat Truck, or even a No. 2 Timber Wagon might be used if a bogie vehicle is required, the load in either case being duly covered over. The No. 2 Timber Wagon resembles to some extent the bogie type of open vehicle used sometimes for conveying theatrical properties and other similar loads.

Empty stock trains, whether of vehicles being worked out to carriage sidings for cleaning and attention before a further spell of duty, or of rolling stock proceeding to the carriage works for periodical overhaul, often include coaches of many different kinds. When working stock trains, therefore, variety in their composition is quite in accordance with actual practice. The correct headlamp indication should be displayed by the locomotive of such a train, this indication requiring the use of a lamp in front of the chimney and one over the right-hand buffer according to the standard code.

Timekeeper Without a Dial—(*Cont. from p. 963*)

which is slightly longer, closes the contacts of both relays at the hour. When the contacts are closed the worm wheel switch can energise the "on" solenoids of the other relays and cause the 10-minute and hour bands to move forward.

The current for the operation of the chronoscope is drawn from the 230-V alternating current mains supplying the station. The driving motor runs direct from this supply, while two sets of transformers and rectifiers supply the direct current required for the control panel circuits. The larger set provides current at 140 V for the brake magnets and the smaller gives an output of 6 V for the solenoids of the relays.

A casing of sheet metal covers in all parts of the clock with the exception of the oblong figure frame, and on this sheeting is fixed neon tubing, advertising William Whiteley Ltd., the firm responsible for the appearance of this strange timekeeper. The transformers and electrical equipment of this sign portion are quite separate from the clock circuits.

The clock has attracted considerable attention since its installation, and even before it was completed its novel form aroused widespread curiosity among railway passengers at Paddington. It was set in motion at noon on 8th November, 1933, by Mr. Gordon Selfridge, who switched on the power that controls the movement of the figures. It covers the whole of one end of the roof spanning platforms Nos. 8 and 9, and in this prominent position it can readily be seen from all arrival platforms, and indeed from most parts of the station.

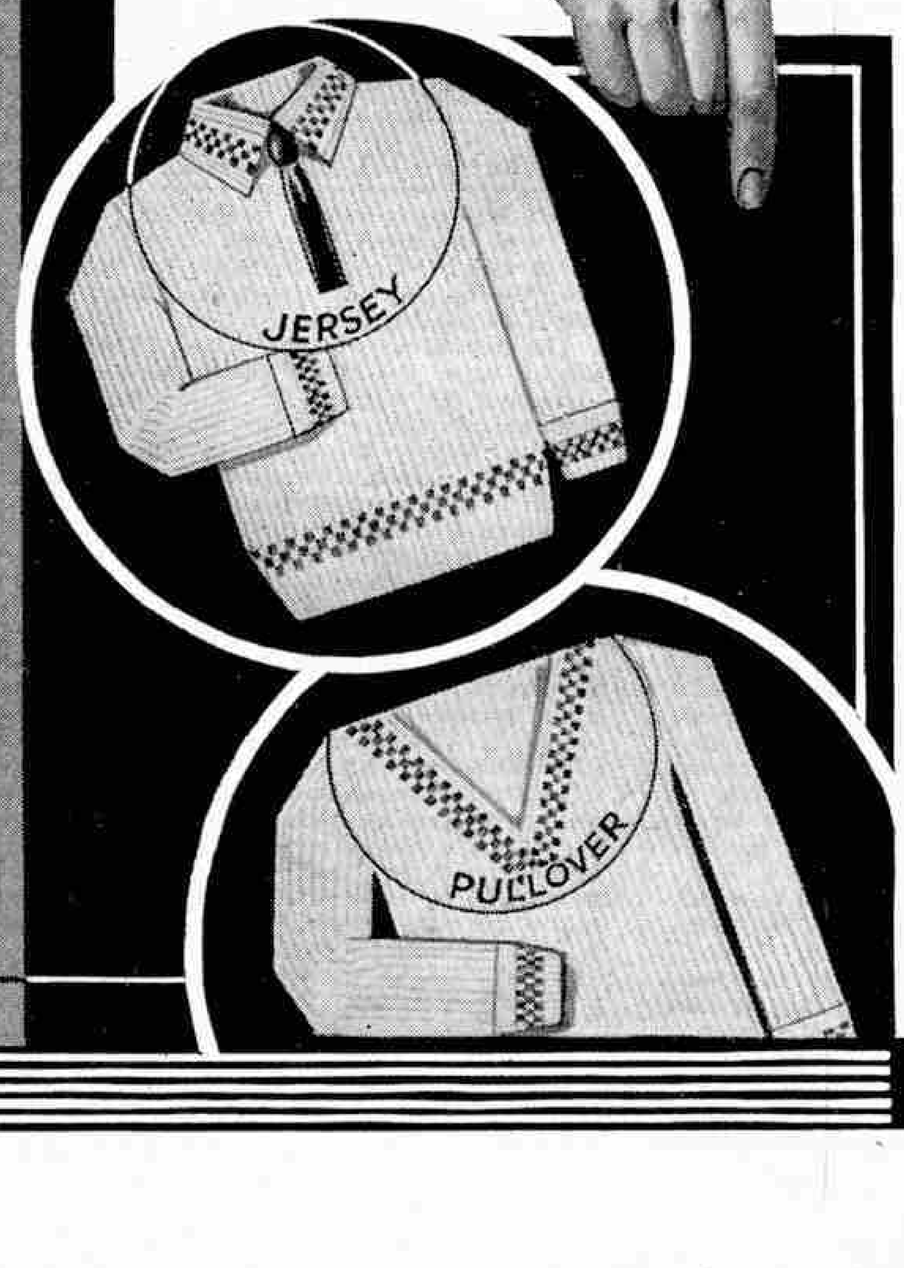
The chronoscope was supplied by Smith's Electric Clocks Ltd., in association with whom the timekeeping portion of the mechanism has been specially constructed by Gillett and Johnston Ltd.

SIZES AND PRICES*

20 inch	chest	8/6
22	,, ,,	9/6
24	,, ,,	10/6
26	,, ,,	11/6
28	,, ,,	12/6
30	,, ,,	13/6
32	,, ,,	14/6
34	,, ,,	15/6

*Post free U.K. only. Add 1/- for Overseas.

APPROVED DESIGNS



MECCANO JERSEYS AND PULLOVERS

FOR CHRISTMAS

You have probably noticed that all the Meccano boys illustrated in the Meccano advertisements and catalogues wear a regulation Meccano Jersey, with dice on the collar, cuffs and waist.

These Meccano Jerseys are now available in a variety of colours, particulars of which are given below. Behind these Meccano Jerseys, the design of which has been approved by Meccano Ltd., is over 30 years' experience of textile manufacture. They are made in a British Factory by British workpeople, from Patons and Baldwins' wool. The colours are fast to light and washing.

The Jersey is also made as a Pullover with a V neck. The sizes, prices and colours are the same as for the regulation garment.

Every Jersey has a special Meccano tab inside the neck. When you see this tab in your jersey you know that it is the genuine article. Each garment is despatched carefully packed in a cardboard box.

For sizes and prices refer to panel in top left corner.

Cash with order.

COLOURS FOR JERSEYS AND PULLOVERS

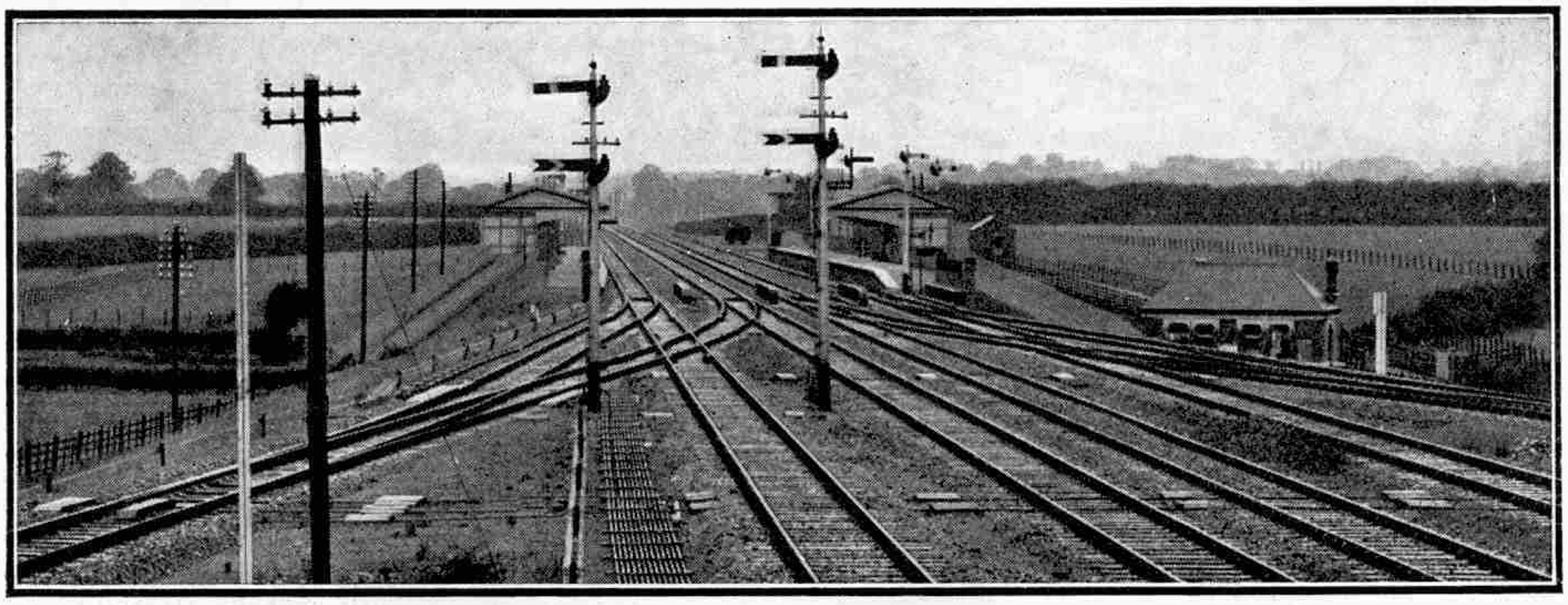
Body Colour	Dice
No. 1 Blue	Orange and Green
No. 2 Scarlet	Blue and Orange
No. 3 Orange	Green and Scarlet
No. 4 Green	Orange and White
No. 5 Grey Mixture	Blue and Orange
No. 6 Heather ,,	Scarlet and White
No. 7 Fawn ,,	Orange and White
No. 8 Lovat ,,	Green and White

Ties to match all colours: 9d. each.

Direct Trading Organisation, 9, Union Court, Liverpool 2

Flying and Burrowing Junctions

How They Avoid Delays



Northolt Junction, where the G.W.R. and L.N.E.R. Joint Line commences. The line on the left is the down L.N.E.R. connection, which has burrowed under the G.W.R. lines in the centre, after leaving the L.N.E.R. up slow line seen on the extreme right. Photograph by courtesy of the G.W.R.

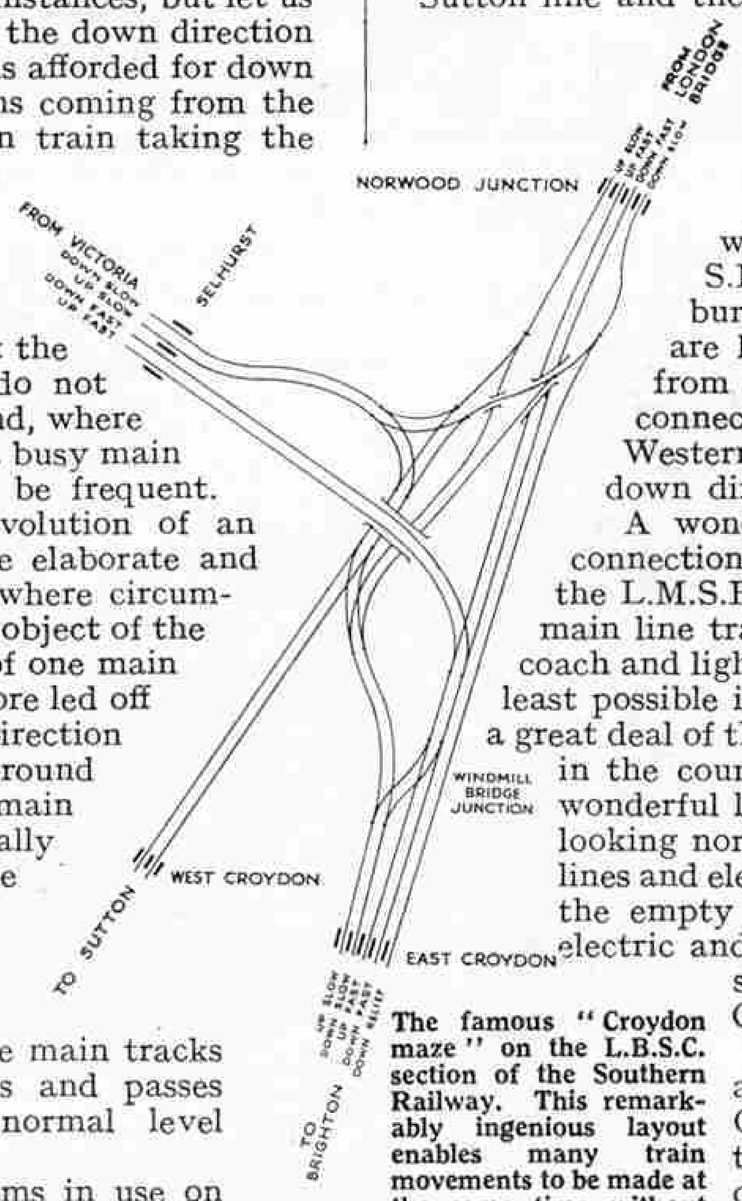
IF we look up the word "junction" in the dictionary we find it described as "a place or point of union." This definition applies with particular aptitude to a railway junction, for it is the place or point of union between two or more systems of tracks. The word thus describes the whole layout where main and branch lines combine, a station serving them, in addition to the actual point where the convergence is effected, being known as a junction.

To turn trains from one line to the other by means of points is quite a simple operation. When there are both up and down tracks, a double turnout or junction of the kind familiar to most travellers is used. This is satisfactory in most instances, but let us suppose we are looking at a double junction in the down direction from the switch rail end. Whereas a clear run is afforded for down trains proceeding to the left road and up trains coming from the right road respectively, the routes of a down train taking the right-hand road and an up train from the left cross one another. Thus in the event of both these trains approaching the junction at the same time, one of them would have to wait until the other had cleared the crossing.

When the service is not particularly frequent the trains can be arranged so that their paths do not usually cross at the junction. On the other hand, where heavy and continuous traffic is the rule, as on a busy main line, delays at such a junction are likely to be frequent.

Considerations of this kind led to the evolution of an alternative arrangement which, although more elaborate and extensive, so reduces delay that its adoption where circumstances permit is well worth while. Briefly the object of the scheme is to eliminate the conflicting crossing of one main and one branch line. One branch line is therefore led off from the main on the opposite side to the real direction of the branch itself. It then ascends, curving round in the meantime, so that it may cross above the main tracks obliquely; and then gently descends, finally coming parallel to the other branch line in the process. This is known as a "flying" junction. The opposite arrangement, a "burrowing" junction, may be employed according to the circumstances and physical surroundings of the situation. Instead of "flying over" the main tracks the branch of a burrowing junction descends and passes beneath them, subsequently regaining its normal level and position as before.

There are numerous examples of these systems in use on our railways, and in busy areas they are found on quite a large scale. The diagram on this page shows what is familiarly known as the "Croydon maze" on the Brighton section of the Southern Railway. The lines from London Bridge diverge into the Sutton and Brighton routes, but both of these have connections with the Victoria lines, which are also linked with those from London Bridge. The ingenious character of the layout will be recognised after studying the diagram and tracing the path of imaginary trains. It is remarkable how the down slow line from London Bridge, without interfering with any fast line, resolves itself into the up slow to Victoria; while at the same time it can reach the Sutton line and the down slow and relief Brighton lines. Again, looking in the up direction, the slow roads from Brighton are on the left of the fast ones at East Croydon; by Selhurst they are on the right and have in no way conflicted with the fast lines.

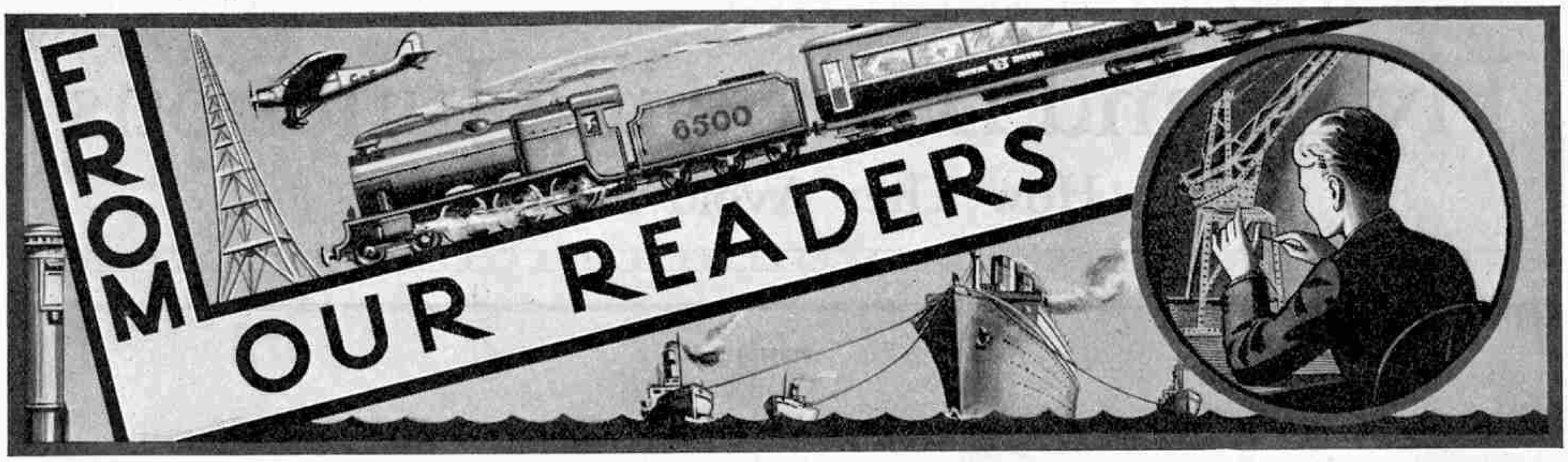


The famous "Croydon maze" on the L.B.S.C. section of the Southern Railway. This remarkably ingenious layout enables many train movements to be made at the same time without conflicting.

On the West London Extension Joint system, which is owned by the L.M.S.R., G.W.R. and S.R., there is a remarkable series of flying and burrowing junctions. Below Battersea, at what are known as the Latchmere Junctions, the lines from the L.M.S.R. and G.W.R. systems divide to connect with all three sections of the S.R.—the Western, Central and Eastern—in both the up and down directions.

A wonderful combination of flying and burrowing connections is situated between Camden and Euston on the L.M.S.R. These were evolved in order to enable the main line traffic, local traffic, electric services, and empty coach and light engine movements to be carried out with the least possible interference with one another. Unfortunately a great deal of the remarkable track work involved is concealed in the course of its burrowing, for it is one of the most wonderful layouts of railway track in the country. Here, looking northward from left to right, the fast lines, slow lines and electric lines in both directions eventually become the empty carriage lines, down fast, down electric, up electric and up fast lines into Euston, and down and up slow lines for Broad Street, while connections to Camden Goods Yard are sandwiched in between!

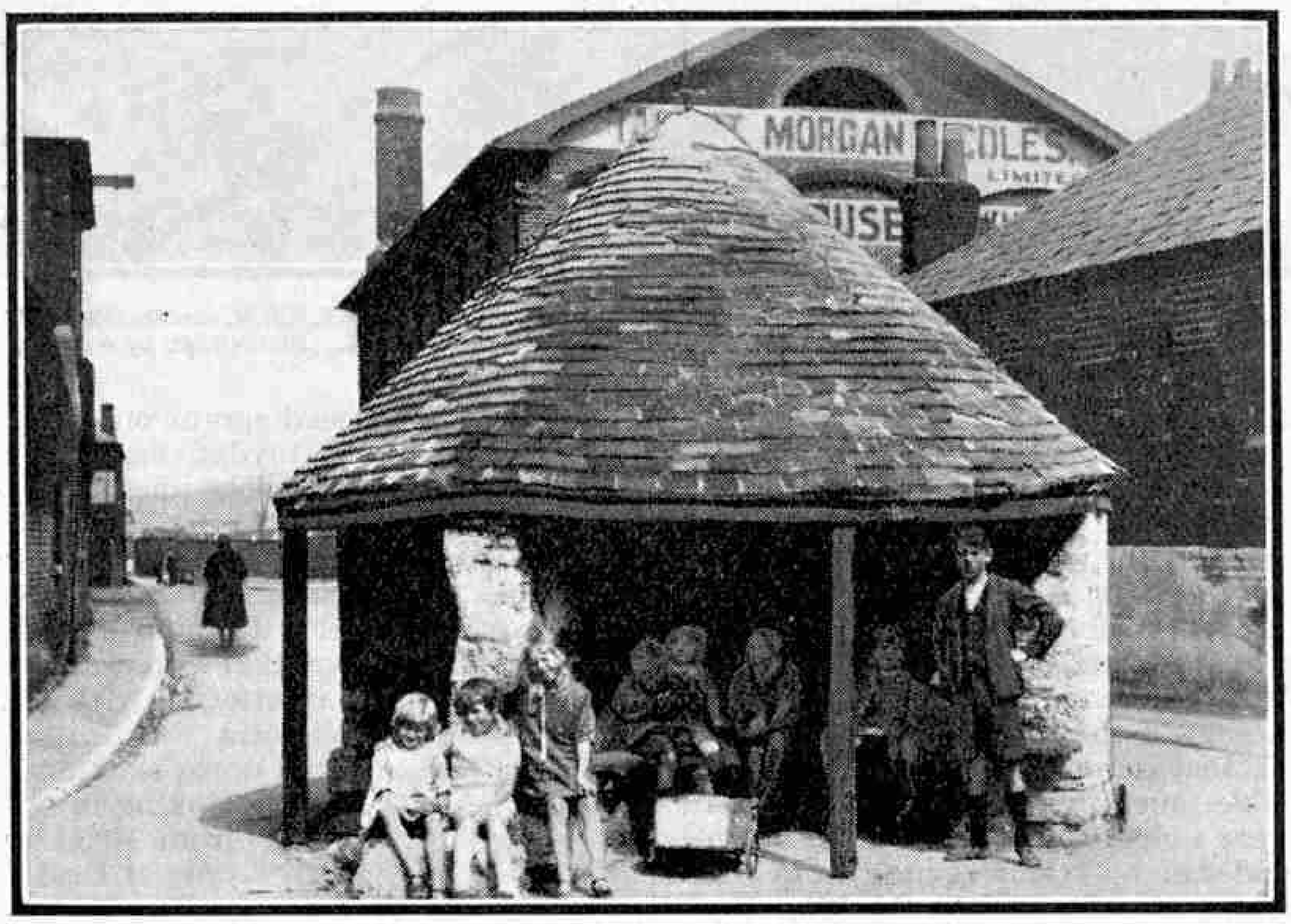
On the G.W.R. Birmingham route, Northolt and Ashendon Junctions, the ends of the G.W.R. and L.N.E.R. Joint line, are of this type; and at Aynho Junction the G.W.R. down line makes a flying connection with the old route through Oxford.



These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Southampton's Old Cross House

The Cross House of Southampton is one of the most interesting of the many old buildings in that town. In the days when a small ferry boat provided the only means of access to places beyond the Itchen, the shores of the river were lonely and wind swept. Those who wished to cross often were compelled to wait a long time for the ferry boat, and in the meantime were without shelter from the piercing winds, or the rain and sleet that often accompanied them.



The Old Cross House near the site of the former ferry across the Itchen at Southampton. Photograph by E. M. Haines, Ringwood.

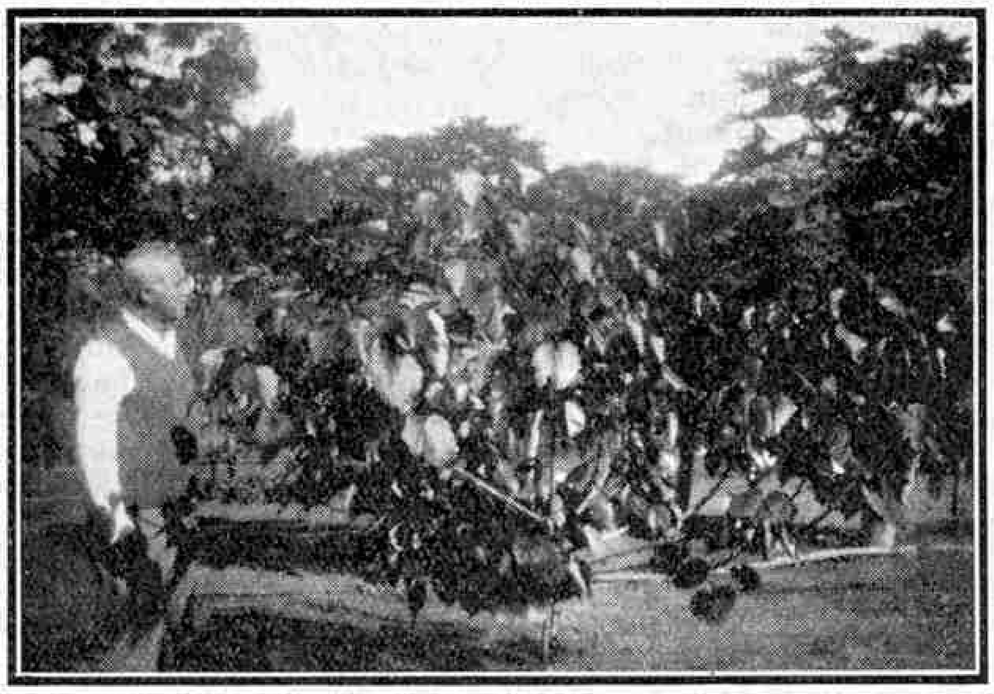
A lady who caught a fatal chill in these circumstances is said to have bequeathed the money required for the erection of a "Cross House," or shelter for intending passengers. As the accompanying photograph shows, this consists of two walls built in the shape of a cross, in order to give protection whatever the direction of the wind, and provided with an ample roof. For a long time the building stood alone, a welcome refuge to many a ferry passenger. To-day it is useless for this purpose, for a little to the south is the busy steam ferry, usually called the Floating Bridge, which consists of two floating structures that are hauled across the waterway by means of wire ropes. It is an interesting memento of an earlier stage in the development of Southampton, however, and appears to have given its name to the road leading to it.

E. M. HAINES (Ringwood).

Growing Tung Oil Trees in Zululand

My father is a pioneer of the cultivation of the tung oil tree in South Africa. Our farm is in Zululand, and we cultivate sugar beet in addition to planting the tung oil tree on an extensive scale, and supplying seedling trees in pots to farmers in all parts of South Africa who wish to take up its cultivation.

"Tung" is the Chinese word for heart, and the name is given to the tree because of the shape of its large, dark green leaves. The flowers are a beautiful creamy white with pink veins and maroon centres, and in the Spring a well-grown tree is a wonderful sight, for large clusters of flowers appear at the ends of the twig terminals some time before the leaves come out. The fruit resembles a small apple in size and shape, and in an outer hard shell contains from three to seven seeds, the usual number being five. These seeds contain the valuable oil, the yield varying from 33 per cent. to 45 per cent. of the weight of the seed itself.



A well-developed tung oil tree grown on a Zululand farm. Photograph by E. R. Füsslein, Mtunzini.

The tree grows quickly, bearing fruit in its fifth year; but does not usually attain a greater height than about 30 ft., with a spread of about 25 ft. We strive to get as many branches as possible. Trees planted in suitable ground and carefully tended usually branch well, and in their second year produce shoots from the stem just above the ground. The more branches there are the greater the yield of fruit, and high-stemmed trees can be induced to

branch low down by removing a narrow strip of bark, halfway round the stem and an inch above a bud, by means of a sharp knife.

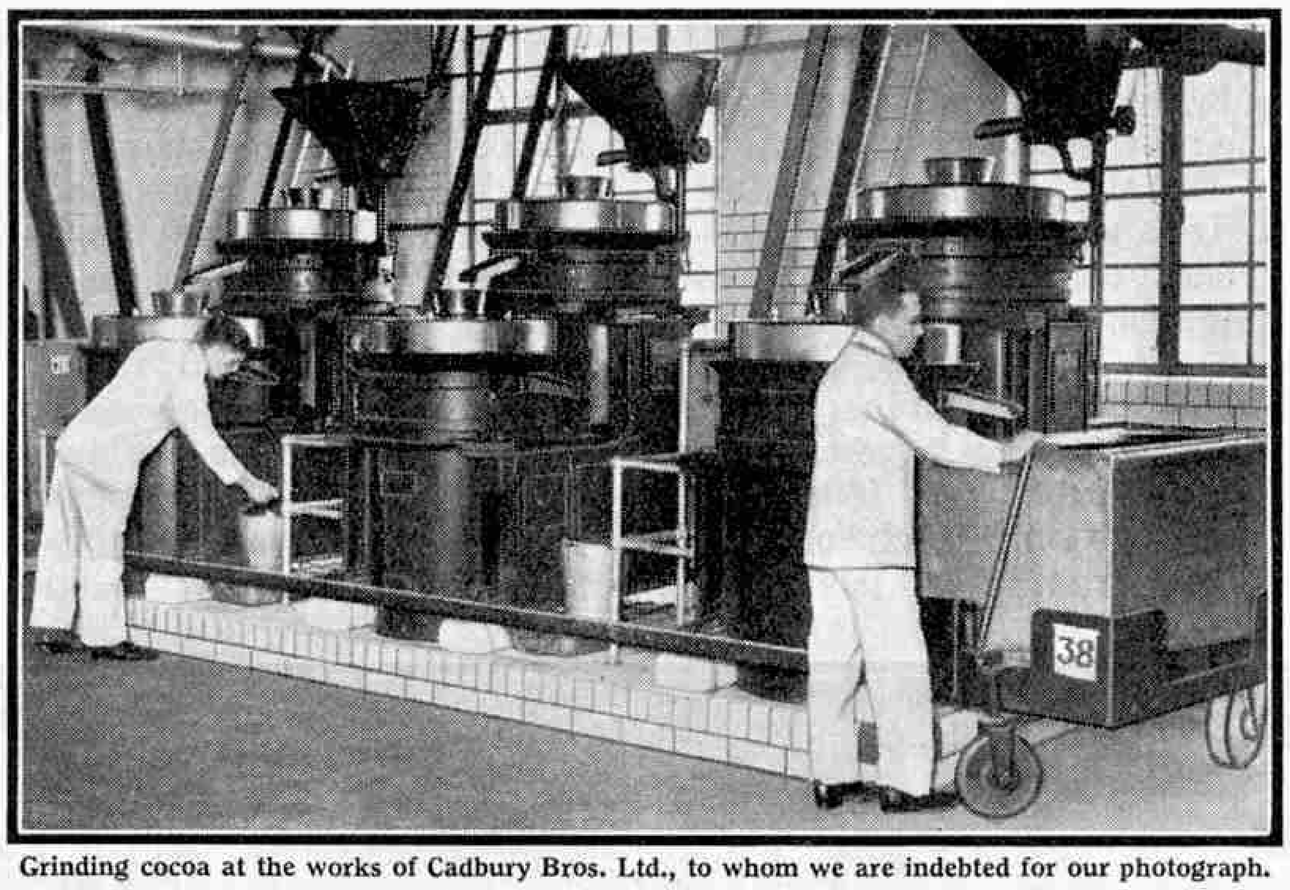
Gathering the crop is very simple. The fruit matures in early winter and is allowed to drop to the ground to be gathered at leisure. It is stored and dried and then hulled, after which the seeds are packed in bags and forwarded to the crushing mills in which the oil is extracted.

Tung oil is in great demand for the manufacture of varnish, paints and linoleum, and the water-proofing of wood. Lately other uses have been found for it in wireless, cable and aeroplane factories. Its chief merit lies in its water-proofing quality and in its capacity to dry without cracking.

E. R. FÜSSLEIN
(Mtunzini, Zululand).

A Visit to a Cocoa and Chocolate Factory

During my holidays this year I visited the Cocoa and Chocolate Works of Cadbury Bros. Ltd., at Bournville, Birmingham. The raw material for the industry carried on there is the cocoa bean, incoming supplies of which are stored in a great warehouse, where they are sifted, cleaned and sorted in preparation for subsequent processes. They are then roasted in large revolving drums or cylinders that are heated either by fires or by circulating superheated steam in pipes passing through them. Next the shells are removed and the beans themselves are broken into pieces called "nibs," which are crushed and ground to a fine powder, an operation that is shown in progress in the accompanying photograph. The finished product is passed through sieves to ensure that it is correctly ground, and conveyed to the packing rooms. There I was greatly interested in the wonderful organisation for the making of tins and of the paper bags that line them. Filling and labelling form a continuous series of automatic operations.



Grinding cocoa at the works of Cadbury Bros. Ltd., to whom we are indebted for our photograph.

Another process that attracted me was the covering of chocolates. This can fairly be described as a craft, and I greatly admired the dexterity with which the operators manipulate the forks and decorating appliances used in adding scrolls and other devices to the chocolate-covered confections. There seemed to be an endless variety of these, and all were dealt with rapidly and easily, the finished products being cooled and packed into cardboard boxes that were put in crates ready for despatch.

While passing round the factory I was astonished to learn that 263,000 pints of milk are used every day in making milk chocolate, and this figure gives some indication of the immense scale of the operations. I was impressed also by the care taken to see that work is carried on in the best conditions, and by the comfortable and attractive appearance of the houses provided on the Bournville Estate for the employees, and the magnificent facilities afforded them for healthy recreation and amusement.

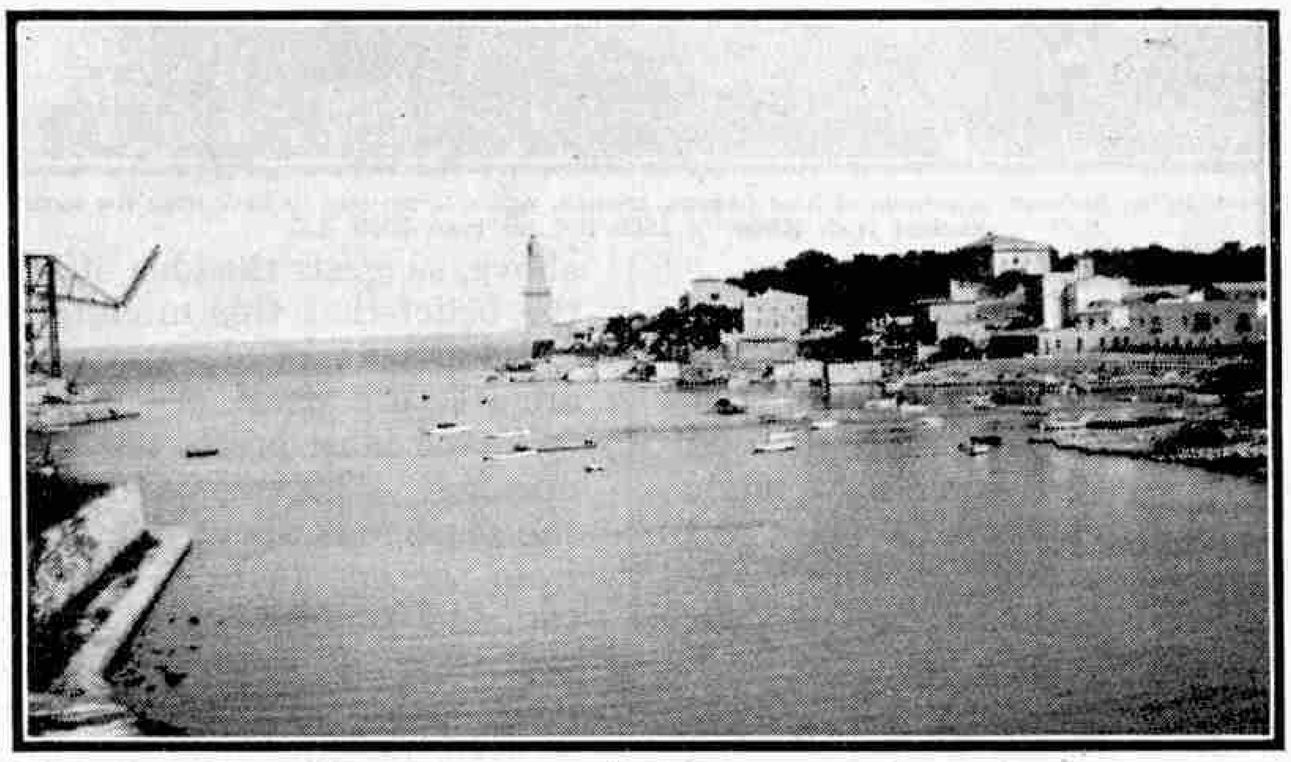
H. BALLINGER
(Birmingham).

A Holiday in Majorca

Until this year the island of Majorca was chiefly associated in my mind with the wars between the Romans and the Carthaginians more than 2,000 years ago, for slingers from the Balearic Islands, of which Majorca is the largest, formed an important part of many Carthaginian armies. I was therefore greatly interested when I learned that a month of my holidays was to be spent in Majorca. I saw nothing that could definitely be associated with the famous slingers of antiquity, of course, but there were many other things of interest to be seen, including Roman remains, marvellous caves with underground lakes, an electric railway with long tunnels cut out of solid rock, and wonderful roads climbing the sides of mountains by means of hairpin bends.

When the Carthaginians and Romans passed away the Arabs took possession of the islands, and I was interested to find that many traces remain of their occupation. Palma, the name of the capital, is indeed a word of Arab origin. Later the islands had a king of their own, but in the 14th century they were united to the kingdom of Aragon.

The climate of Majorca is warm and sunny and I thoroughly enjoyed my stay there. Bathing in the blue water round the coast was one of my chief occupations. The water is so clear that the sandy bottom can be seen distinctly, and one morning, when swimming in water about 12 ft. deep, I readily distinguished a lobster taking a stroll on the sand directly beneath me.



The harbour of Porto-Pi, an ancient roadstead a little to the west of Palma, Majorca. Photograph by A. Frodsham, Crowborough.

The west coast of Majorca is precipitous, but the other coasts are low and sloping, and there are many good bays with ports or harbours on them. The most important bay of course is that of Palma, and Porto-Pi, the small harbour shown in the accompanying photograph, is a little to the west of Palma itself.

A. FRODSHAM (Crowborough).

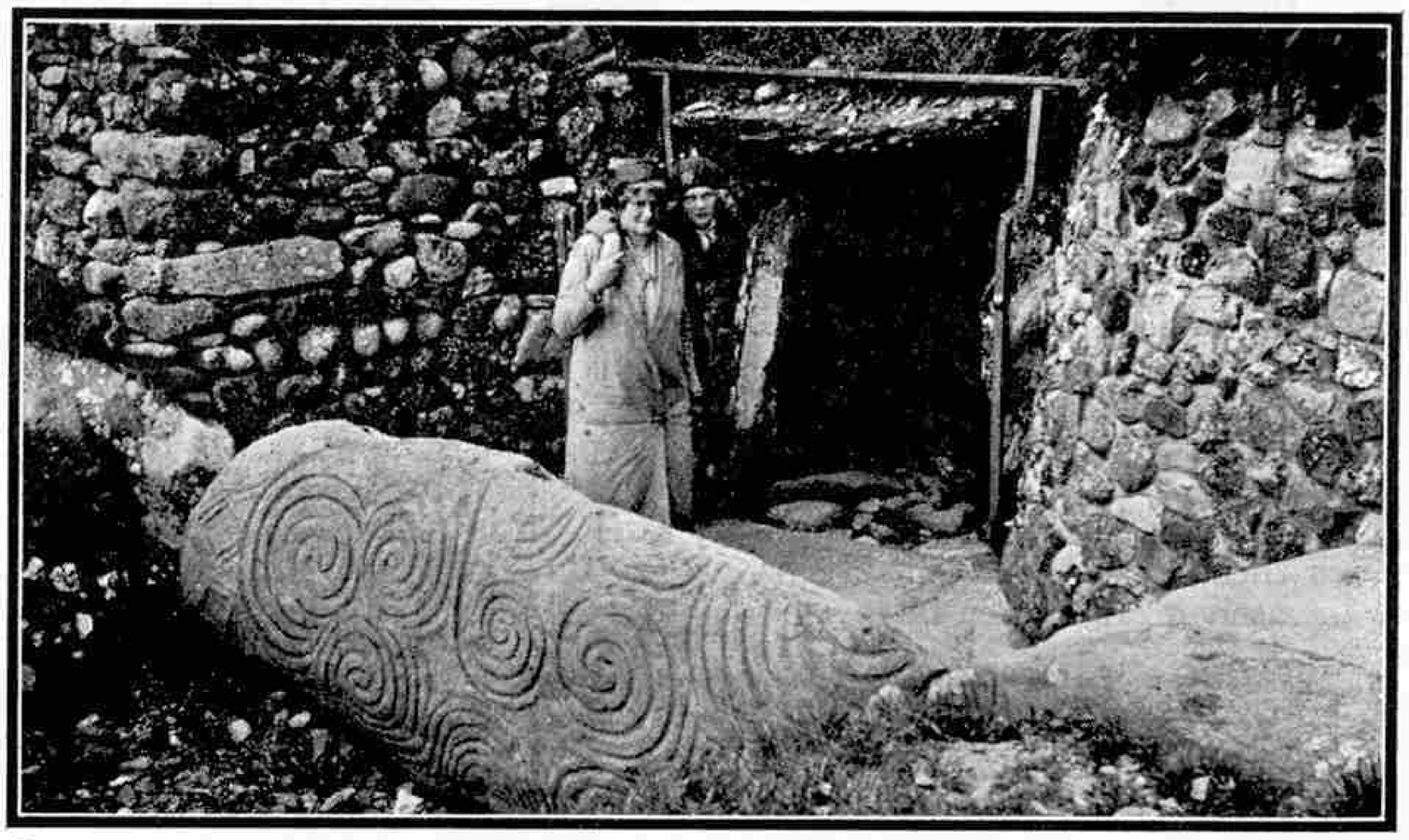
An Irish Tomb as Old as the Pyramids

Possible Burial Place of Ancient Kings

By August Renton

FIVE miles west of Drogheda, and extending from there about five miles along the northern bank of the river Boyne, are the remains of the most remarkable pre-Christian cemeteries in Ireland, supposed by well-known authorities to date back to 1500 B.C., or even 2000 B.C. The principal remains are three mounds, at Dowth, New Grange and Knowth respectively, situated about a mile apart and within sight of one another. That at New Grange is the best known and the largest. The chamber of this tumulus was opened about 1699, and since then has attracted the attention of archæologists from the Continent as well as from these islands.

New Grange is a few miles from the ruins of ancient Tara, that palace of the Kings of Ireland made for ever famous by the poet Moore, in his verses beginning "The harp that once through Tara's halls." On account of this proximity some authorities think that the tumulus was the burial place of the ancient Kings, and when at the height of its magnificence this mound would have been a fitting receptacle for royal remains.



The entrance to the tumulus or mound at New Grange, Ireland, which is thought to have been the burial place of ancient Irish Kings of 1500 B.C. or even 2000 B.C.

When seen from the road the mound is rather disappointing, for it is overgrown with trees and bushes that obscure its outline, and the rising ground on which it is built detracts from its height. Originally it was covered with shining white quartz that would have made it a conspicuous monument for miles around. Only odd portions of the quartz remain, however, and the whole effect is spoiled by the overgrowth of trees and bushes. The tumulus itself is about 44 ft. high and 280 ft. in circumference. It appears to have been surrounded originally by a circle of standing stones a few yards from the base, and 12 of these can still be traced. Four of them standing near the entrance are of great size, the largest being eight ft. high and 20 ft. in girth.

The actual burying-place within the tumulus is cruciform in shape, a long passage ending in a large domed chamber with three side chambers. The entrance was originally closed by one huge slab of stone, about 10 ft. long and three ft. wide, that remains in a marvellous state of preservation in front of the opening. This stone is covered with hieroglyphics, the meaning of which is a much disputed point. There are lozenges and spirals, not only on these outer stones, but also on the stones lining the passage and the chambers. Some authorities say the spirals represent the musical instrument that was whirled round and round by the ancients to scare away evil spirits; other archæologists declare the markings to be similar to those found on ancient monuments in Asia Minor, Scotland and Wales, and to be Phœnician in character. In this connection it is interesting to note that in the ancient Gothic Sun-cult the spiral was the symbol of the Sun's apparent daily revolution round the Earth, while a double spiral was the symbol of resurrection in Aryan religions of 4000 B.C.

The door leading to the passage is composed of three large slabs, two of which stand upright with the third across their tops. The horizontal stone is carved very beautifully in what is known as the saltire or gate pattern, and is one of the best samples of carving in relief in the tumulus. The whole effect of the entrance, with its huge carved stone at the bottom and the carved course above, suggests the idea of a facade, and has given rise to the belief that this monument marks not only the first development of decorative design in Ireland, but of architecture itself.

A cold blast greets one on stooping down to enter the opening. This is only 4 ft. high, and the average width of the passage is about 3 ft., except at a point about 14 ft. from the entrance. There the side stones meet at the top, and for a few yards therefore it is necessary to crawl on hands and knees. There are various designs on the walls and ceiling, and candles are provided for visitors so that nothing may be missed.

The passage is about 62 ft. long, and it is a relief to reach at last the inner chamber, which is about 12 ft. in diameter and 20 ft. high. The roof is a marvellous construction, consisting of a funnel-shaped dome formed of flat stones laid horizontally, each projecting inward over the one below it until the opening is small enough to be closed by a single large stone. In the centre of the room is a large stone basin with two cup-like indentations that have caused much conjecture. This basin originally stood inside another basin in the right-hand recess. Indeed. each of the three recesses originally contained

one of these basins, but one is broken and another is little more than a slightly hollowed stone. It is supposed that they were used for cremation purposes, or as receptacles for offerings at some unknown rite connected with burial. Under one of them were found lumps of charcoal, over 900 pieces of charred bones, human teeth, fragments of human skulls, and 154 or more pieces of rude pottery.

The chamber on the right is the largest of the three recesses. There are marvellously intricate designs on the roof, and the same spirals are found here as on the entry stone, together with concentric circles that probably are symbolic of eternity. The herring-bone pattern, sometimes called the palm-branch or fern-leaf pattern, is very distinctly carved on the side walls. This pattern occurs again in the left recess, and there is even more realistic. To the left of the base of the branch in the design is a row of small chevrons that may be meant to represent the water from which the fern-leaf springs.

Stone at the rear of the New Grange mound. The spiral markings on this, and on the stone at the entrance, shown in the illustration on the opposite page, are similar to those found on ancient monuments in Asia Minor.

In the chamber on the right the basin is supported on a large block of granite, whereas that in the recess facing the passage is just a round slab of stone that may have been hollowed out at one time, but now resembles a large football.

In the left-hand recess, apart from the ordinary wall carvings, there is a small design of intense interest. A few strokes that are upright and one that is horizontal constitute the figure, but the likeness to the rock tracings of galleys in Scandinavia have proved conclusively to some authorities that these markings, so clearly cut in the rock face, also represent a galley or ship. The marvellous clearness of the drawings is the more remarkable when it is taken into account that these old tumuli in Ireland belong to the Bronze Age, and that the designs therefore must have been chiselled out with a bronze instrument. There seems conclusive evidence that most of the decorative work was completed before the stones were put into position, for the lack of artificial light would have made subterranean carving impossible.

What tremendous scope there is for conjecture in this amazing relic of past ages! How were the stones placed in position? Was the granite quarried somewhere near at hand, or brought all the way from the Wicklow or Mourne Mountains, as some seem to think? How did the spiral design reach Ireland? Did it come by way of Britanny and England, or was it brought by parties of hardy seafarers from the lands around the Baltic Sea, who invaded the Scotch and Irish coasts bringing with them art learned from invaders from the Mediterranean?

It is difficult to say definitely, and there is much diversity of opinion among archæologists; but it is certain that this marvellous monument at New Grange not only manifests the beginnings of art in Ireland, but also reveals the architectural ideas of the Irish of 1500 B.C.

The Romance of Salt—(*Continued from page 967*)

into the steam chamber of the second vessel, where it yields up its heat in effecting the evaporation of the brine. Similarly steam generated in this vessel heats and evaporates the brine in the third, the steam from the brine in this pan being withdrawn by means of a pump and condensed. A partial vacuum is produced above the brine in each vessel by the condensation of the steam generated in it, and thus the evaporation takes place under diminished pressure and the brine boils at a lower temperature than would be reached at atmospheric pressure. This is a more economical method of working than evaporation in open pans.

As the brine becomes more concentrated, it passes saturation point and the excess of salt crystallises out and collects in the conical bottoms of the vacuum pans, which are provided with special devices to enable it to be withdrawn without affecting the pressure above the brine. The salt is removed by means of bucket elevators and is carefully dried in specially designed plant that rapidly removes practically every trace of moisture. It is then sifted and graded, and removed to the storage warehouses for packing or delivery into the vessels in which it is exported. Throughout these processes it travels on conveyors and is not handled or exposed to the atmosphere for any prolonged period from the time it leaves the evaporator. Even packing is automatic, the machine filling, folding and sealing the cartons.

Salt is produced in many industrial varieties differing in crystal size and in purity. Differences in "grain," or the size of the crystals, affect the value of salt for any particular purpose and are brought about by careful control of the temperature of evaporation. What is known as vacuum salt is moderately fine in grain, and is employed generally for food purposes and in manufacturing operations. A finer grade of lower density is called "boiled and stoved salt" and is produced in open pans in which the brine is kept continuously at boiling point while crystallisation is taking place. The individual grains in this grade are flaky and the salt crystals are less tightly packed than in vacuum salt. Salt blocks are made by packing it when warm and wet from the pan into rectangular wooden moulds and drying or "stoving" these thoroughly for from seven to fourteen days in a warm atmosphere.

A fairly coarse salt is required for curing and preserving fish, and fishery salt therefore is produced by slow evaporation of brine at a low temperature, for large cubical crystals are obtained in these conditions. The largest crystals are those of bay salt, a dense hard salt that is made in open pans at lower temperatures than are employed in the production of any other variety.

The finest of all varieties of salt is that packed and sold for table use. This must be pure as well as very finely grained, and in making it the brine itself therefore is purified before evaporation. The chief impurities are salts of calcium and magnesium, which are removed by a precipitation process, and evaporation of the brine then gives a product that is practically 100 per cent. sodium chloride. The evaporation is carried out rapidly and at a low temperature in order to form very fine small crystals.

Junior Section—(*Continued from page 1025*)

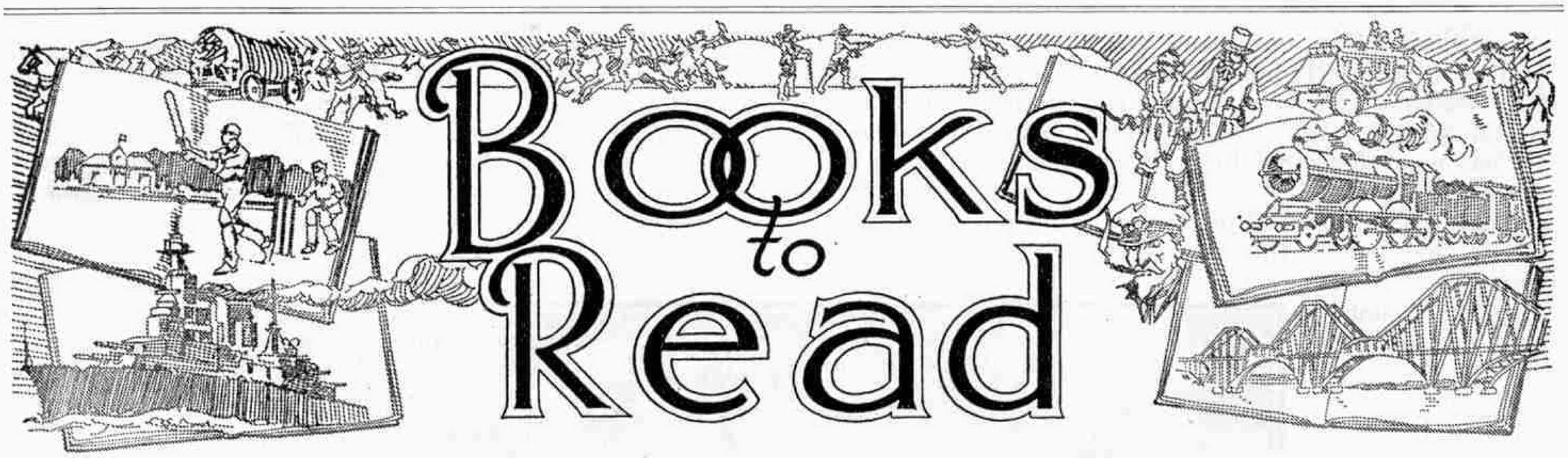
fields and herds of cows in others. All these animals are of course Dinky Toys, and in another spot coming along the road we see a shepherd with his sheepdog and flock. We dash over the Level Crossing by which this road passes over the line, and we notice waiting by the gates several very smart Motor Cars and some Commercial Vehicles and Delivery Vans. At this crossing is situated a stopping place formed of two M Series Wayside Stations, one on each side of the line.

We now run into a Cutting which prevents us from seeing any more of the "country" at present and then rounding a curve we slow up and stop at an intermediate main line station. While we are there a goods train comes past in the opposite direction with a Hornby No. 1 Special Tender Locomotive at its head. The train consists for the most part of Hornby No. 1 and No. O Open Wagons loaded with coal, and we also notice one of the "Meccano" Coal Wagons. The appropriate goods Brake Van completes the train.

The reason for our wait is explained by the fact that the next section of the line is single track only. Taking advantage of our stop therefore, the goods train was sent through. This single track soon leads up to a short incline and so on to a Hornby Viaduct. Descending rapidly on the other side we pass through a short tunnel and while still in the "country" we come across an extensive shunting yard. Here we see numerous examples of Hornby Goods Rolling Stock for almost all kinds of traffic, Cattle Wagons, Timber Wagons, Milk Vans and Petrol Tanks are all there. Some are loaded, others empty and some again drawn up alongside a Goods Platform. An express meat train is on the point of leaving the yard as we go by. It is made up of a Refrigerator and Meat Vans and is hauled by yet another type of Hornby Locomotive, different from any we have yet observed. This is the No. O Locomotive which is very suitable for light fast goods trains.

Soon we arrive at our destination, a station similar in design to that from which we departed. As the train comes to rest we notice the Station Staff ready to deal with the passengers and their luggage. As at the starting point and the intermediate station at which we stopped there are Hoardings displaying Posters.

Passing from the platform we give up our tickets to the Ticket Collector and our railway journey as Dinky Toys is over! Looking over the line again from our ordinary point of view we see that the actual operation of the train itself is interesting, but is rendered even more so by the various accessories that are used in conjunction with it. Accessories therefore, play a large part in securing the correct effect on a miniature railway system.

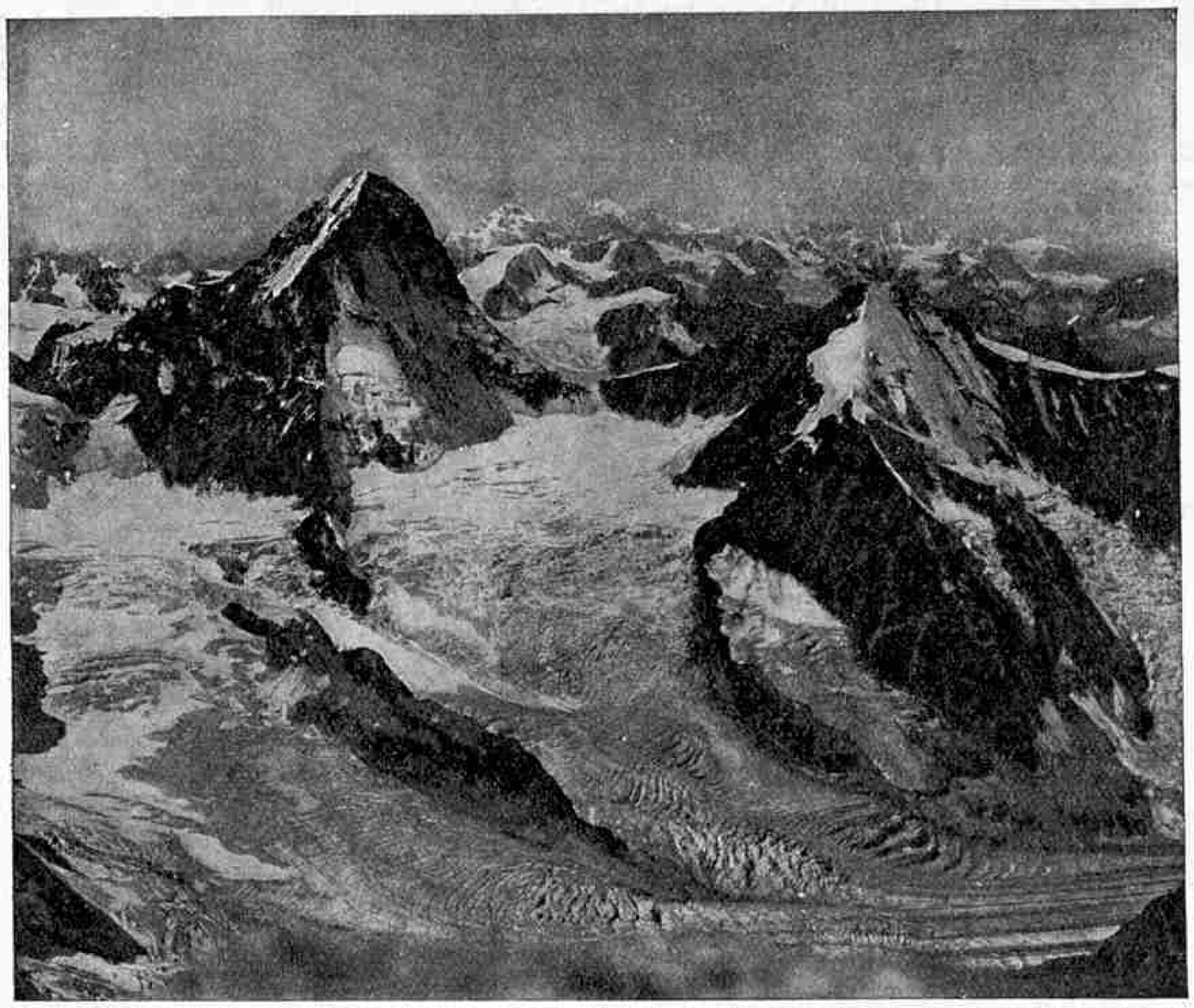


Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/– for postage to the price. Postage on different books vary, but any balance remaining will be refunded.

"Two Thousand Years of Science"

By R. J. HARVEY-GIBSON. (Black. 12/6 net)

Since the World War there has arisen a widespread demand for books dealing in a non-technical but accurate manner with the discoveries of science, and explaining how those discoveries affect our ideas of the world around us and of the Universe as a whole. Many of the more recent scientific developments are difficult for the ordinary person to understand. Some of this difficulty arises from the mathematical nature of the modern theories, but much of it is due to the absence of knowledge of scientific history. In other words, in order to understand modern science it is necessary to know something of the steps that have led up to it. In "*Two Thousand Years of Science*" the late Dr. Harvey-Gibson set out to supply this knowledge, and the second edition of this book, revised by Dr. A. W. Titherley, may be regarded as the most successful attempt so far made to outline the growth of science from early times down to the present day.



A typical mountain scene. Dent Blanche and the Grand Cornier, Switzerland. (From "Two Thousand Years of Science," reviewed on this page.)

Two short chapters pass in review the discoveries of the ancients, remarkable for their time, and of the few really serious philosophers of the Middle Ages, and bring us to the Somersetshire monk Roger Bacon (1214-1294), who was one of the first to refuse to accept blindly the statements of any writer, no matter how famous he might be. "Take nothing on trust" was his motto, and he set to work to experiment seriously in chemistry and physics—so seriously indeed that he was suspected of dabbling in black magic!

The invention of printing from movable type and the wide circulation of books that it made possible enabled a rapidly increasing public to learn what was going on in the scientific world, and paved the way for the great advances that took place in every branch of science in the 16th and 17th centuries. Such men as Newton, Galileo, Harvey and Boyle were responsible for these advances. The changes in outlook that they brought about led eventually to a remarkable outbreak of interest in science, and the late 18th century and the early 19th century saw the beginnings of the modern scientific age.

This we owe to the work of such great pioneers as the Herschels in astronomy; Young, the originator of the wave theory of light; Faraday, and others in physics; and Priestley, Cavendish, Lavoisier, Dalton and Davy in chemistry. One of the most remarkable features of this stage of the development of science was the growth of our knowledge of the Earth itself and of the living creatures that inhabit it. Many great scientists contributed to this knowledge, but Charles Darwin stands supreme among them as the founder of evolutionary theory.

The way for the development of modern science was cleared by the work of these men, and the more intensive study of all branches of knowledge in recent times has led to many striking developments, particularly in the application of scientific knowledge to matters of everyday life. The branch of science that perhaps is of chief interest to the ordinary reader to-day is physics, for this deals largely with the proton and the electron, the bricks of which the entire universe is built. The author explains the manner in which these were first tracked down in the vacuum tubes of the physicist, and how their behaviour has thrown light upon the constitution of the Sun and of the most distant stars and nebulae. This in turn leads to the wonderful story of the growth of our ideas of the Universe, and of the modern views of space and time that have followed on the acceptance of Einstein's theories of relativity.

Other branches of science are dealt with in a similar manner, and in every case the lucid account given of the growth of modern ideas on each subject helps readers to understand the present position. Finally the point is emphasised that the various branches of science are not isolated, but depend closely upon each other, and have as their climax the story of Man himself. In the author's words, the "story of his [Man's] own origin from the primordial protons and electrons dotted through ethereal space . . . is indeed a marvellous one, if only we take the pains to read it, and the most wonderful fact in it is, that it should culminate in a being able to comprehend it all." The story is briefly told of the development of human life from the primitive ape-like beings whose existence has been revealed in a fragmentary manner by discoveries of their fossilised bones and of the crude tools and implements they used; and the small range of human existence in comparison with the age of the Earth itself is strikingly emphasised.

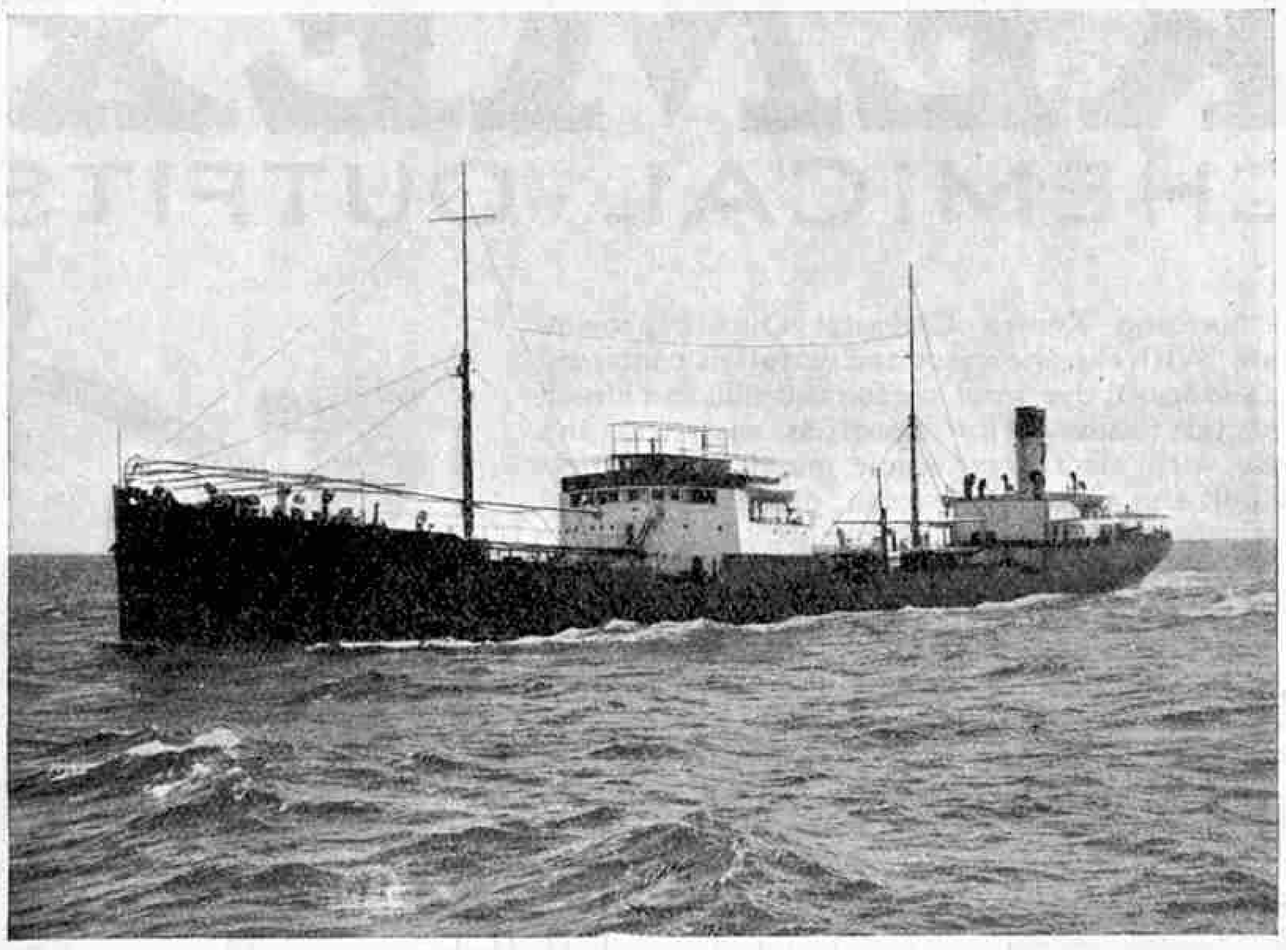
At the end of the book there is an interesting and useful chronological table of the discoveries that are milestones in the progress of general science and of the names of the scientists responsible for them. The book is well illustrated by line drawings and a half-tone frontispiece, but we regret the absence of photographs, the inclusion of which would have added to its attractions. A good feature is the unusually comprehensive index.

"Merchant Ship Types"

By A. C. Hardy. (Chapman & Hall Ltd. 5/- net)

A cheap edition of this book will be welcomed by all who are interested in merchant shipping, which in this sea-girt island means nearly everybody. Although the book was written for students of naval architecture, of marine engineering and of shipping, it contains a vast amount of material that is of interest to the general reader. It deals with the particular types of ships that are engaged in the transport of people and merchandise over oceans and seas, describing their characteristic features and the special requirements that have made these features necessary.

Starting with ocean transport, the author deals with the fast passenger liner, which has reached its highest expression in the Atlantic giants of the past few years. A particularly interesting comparison is made between the design and arrangements of typical Cunard and White Star liners. Speed, safety and luxurious passenger accommodation are essential to all vessels of this class, and in each of these directions there has been steady progress year by year.



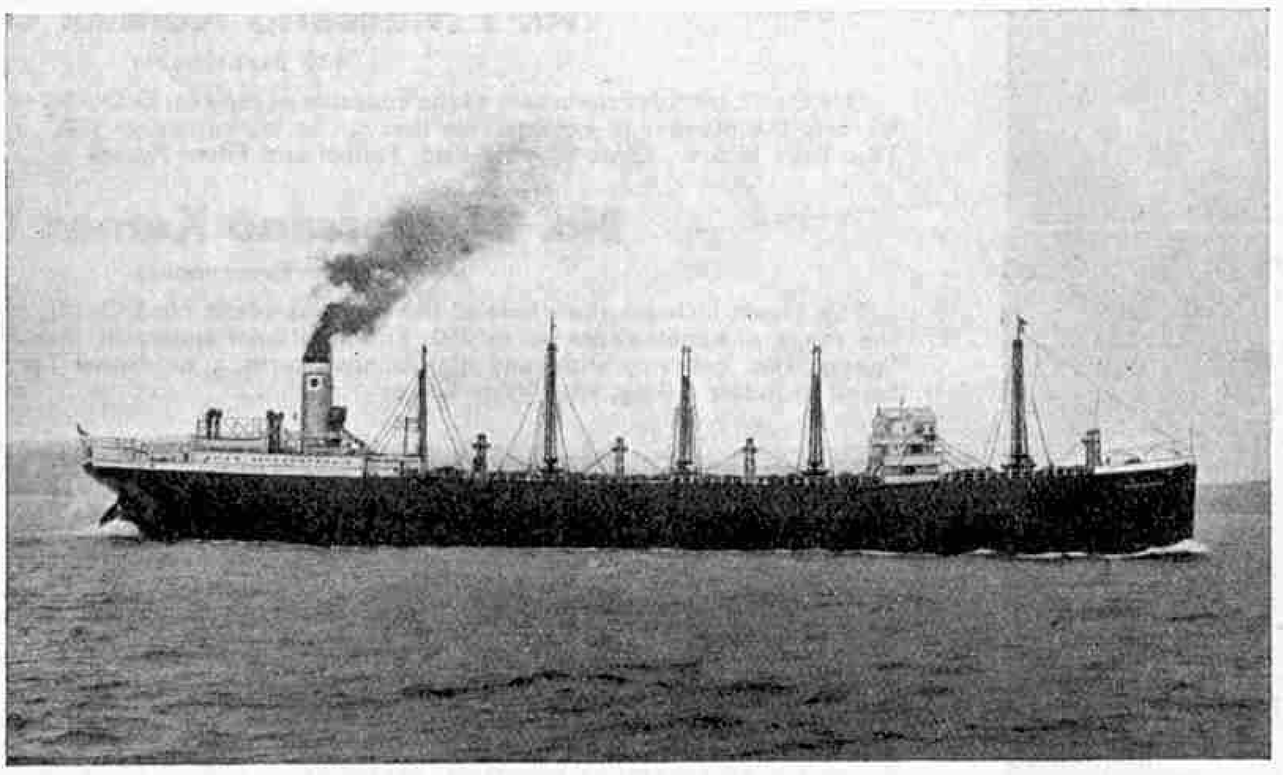
An Oil Tanker at sea. (From "Merchant Ship Types," reviewed on this page.)

Next we come to the intermediate passenger-cargo liner, sometimes spoken of as a "mixed" liner. Vessels of this type carry fewer passengers but much larger quantities of cargo than the pure ocean mail liner. Such vessels usually run on routes where speed is not a main requirement, where cargo as well as passengers make their running a paying proposition, or where the number of passengers available does not justify the running of larger and faster ships. Their passenger accommodation is not so luxurious as that of the fast ocean mail liner, but is thoroughly comfortable, and well adapted for those who do not wish to pay the higher fares demanded on the faster vessels. Some intermediate passenger-cargo liners are fitted with refrigerating machinery and insulated holds for the carriage of meat or perishable cargo. Then there are the ocean-going cargo carrier, in which the passenger element is reduced to very small proportions, but as a rule not entirely eliminated; and the vessels employed in the bulk transport of such materials as oil, grain, mineral ores of different kinds, and coal.

Leaving the ocean, we come to the cross-channel services, which to-day are of enormous importance. The vessels employed on them are very fast and the passenger accommodation is as comfortable as could be desired. On those services, too, are all-cargo steamers that carry heavy freight that cannot be dealt with by the larger and faster passenger vessels. An excellent account is given of sea-going cargo vessels of all types. These include vessels designed for the Europe-Mediterranean trade, those engaged in North Sea work, and coasting steamers that carry goods to some of the smallest and most tidal ports around the coast.

A special section of the book is devoted to such vessels as ice breakers and train ferries, and to a group of vessels the author includes under the heading, "Subservient Transport," including cable ships, dredgers, tugs, and salvage vessels. Finally, sea-going power fishing craft, the trawler and the drifter, are given a chapter to themselves, which they thoroughly deserve.

The book is illustrated by a large number of photographs and line drawings. Features of special interest are a series of folding plates showing the general arrangements of characteristic vessels of different types,



The Topside Ballast Tank Collier "Borbeck." (See above.)

and a series of silhouettes of the types of vessels that are discussed in the various chapters. These silhouettes are all drawn to scale, so that they give an excellent idea of the sizes of the different types. There is also an interesting summary of the routes taken by the representative types of ships, and the frequency of the services.

It is regrettable that apparently no attempt has been made to bring this new edition up to date.

Stories of Mystery and Adventure

"The Lone Hand," by T. C. Bridges (Warne, 1/-), is a short but excellent story about an engineering scheme in South America, in which a wicked plot is circumvented by two British youths. *"The King's Pipe,"* by Captain G. E. Gurdon, D.F.C. (Warne, 1/-), is a genuine thriller, dealing with the efforts of a dangerous international gang to exploit a substance found on a lonely volcanic island in the Pacific, from which a poison gas of appalling deadliness can be made. From the same author comes also *"Saracen Junior"* (Warne, 1/6), an interesting combination of a school story and a treasure hunt. *"Greenwood Gold,"* by Norman Booth (Warne, 1/6), is a story of Robin Hood, and it tells how the outlaw and his merry men outwitted the Sheriff of Nottingham, and brought away treasure chests from Nottingham Castle under the very nose of the men-at-arms.

School Stories

"The Twelfth Man," by Major Charles Gilson (Warne, 2/6), is a well-written story on familiar lines. Cricket plays an important part, and the intervals are filled up with the attempts of two juniors to make things hot for an unpopular master. *"The Phantom Pen"* by Hylton Cleaver (Warne, 3/6), is mainly concerned with a series of anonymous letters that are causing consternation at Duke's School among masters and boys alike. The manner in which the mystery is solved is ingenious, and the story is interesting to the very end.

Annuals

(R.T.S.)

The 56th volume of *"The Boy's Own Paper"* (12/6 net) is a worthy successor to its predecessors. The serials by well-known writers are all that could be desired in the way of excitement, and the many short yarns of school life and adventure cater for all tastes. The general articles maintain the high standard of past series, and a new series under the heading "Facts and Fun in Factories," describe visits to various modern works. The volume is well illustrated.

"The School Boy's Annual" (3/6) net) follows the lines of previous volumes, and contains excellent stories of school life and adventure.

"The New Empire Annual"

(R.T.S. 7/6 net)

This volume, which is intended for young readers both in the Homeland and in the Dominions and Colonies, is given an enthusiastic "send off" by the High Commissioners of India, New Zealand, Canada and Newfoundland, and the Acting Commissioner for Australia, whose messages of goodwill are printed on the wrapper. It contains some fine yarns, and first-class general articles.

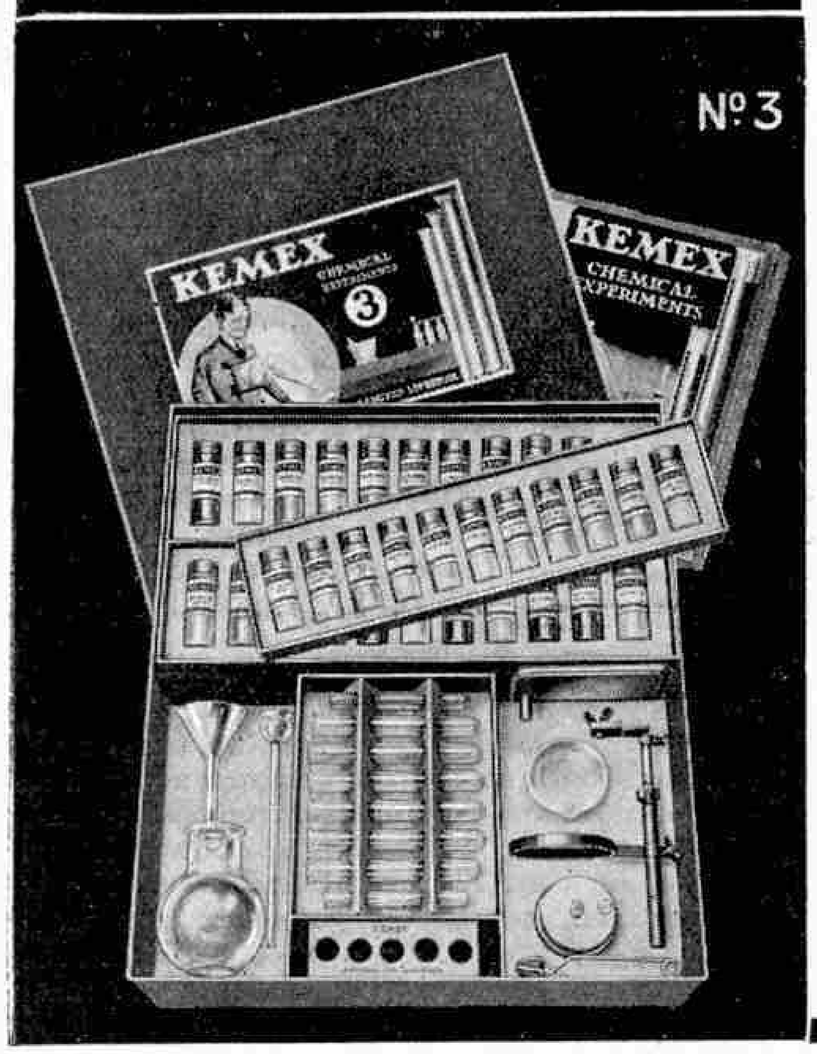
MECCANO KEMEX O

CHEMICAL OUTFITS

PRODUCT of MECCANO LIMITED LIVERPOOL

The contents of the Meccano Kemex Chemical Outfits provide many hours of fascinating fun. With the apparatus and materials contained in them a boy can make inks and soaps; dye wool, cotton and silk, and bleach fabrics that are already dyed; test foodstuffs for impurities; analyse air and water; grow crystals; write with electricity; smelt metals from their compounds; make invisible inks and a chemical garden; prepare gases, and perform a host of other interesting chemical experiments.

The Outfits include everything necessary, and the hundreds of experiments that can be made are described in a simple manner in an attractive Manual that is included in each Outfit. The Manuals are illustrated with a series of actual photographs showing how the apparatus required is fitted up, and the manner in which each experiment is carried out.



No. O Meccano Kemex Outfit

75 Experiments

This Outfit includes a supply of specially selected chemicals, packed in airtight containers, together with a length of Magnesium Ribbon, sufficient to perform 75 attractive and varied experiments. The apparatus provided includes Test Tubes, Test Tube Brush, Delivery Tubes and Corks, and a simple and highly efficient Spirit Lamp that makes the Outfit completely self-contained ... ... Price **5/-**

No. 1 Meccano Kemex Outfit

130 Experiments

This Outfit includes the whole of the contents of the No. O Outfit, together with further chemicals that increase the number of experiments that can be performed to 130. The additional apparatus includes a Test Tube Holder, Glass Stirring Rod, Funnel and Filter Papers ... ... Price **7/6**

No. 2L Meccano Kemex Outfit

250 Experiments

This Outfit includes the whole of the contents of the No.1 Outfit, and further chemicals that increase the range of experiments up to 250. The additional apparatus includes a porcelain Evaporating Dish, Special Test Tubes to withstand high temperatures, a handsome Test Tube Stand, and an Evaporating Stand including a Ring, with Wire Gauze ... ... Price **15/-**

No. 2B Meccano Kemex Outfit

This is exactly the same as the No. 2L Meccano Kemex Outfit, except that a highly efficient Bunsen Burner, with the necessary length of rubber tubing, is included in place of the Spirit Lamp ... Price **15/-**

No. 3L Meccano Kemex Outfit

350—400 Experiments

This is a splendid complete Outfit that provides a boy with all he requires to carry out between 350 and 400 experiments, and thus enables him to acquire a sound knowledge of the fascinating principles of chemistry. The Outfit includes the contents of the No. 2 Outfit, with additional chemicals and apparatus. The latter includes a gas-generating apparatus, consisting of a large Wide-necked Flask with Thistle Funnel and Delivery Tubes, a Blowpipe and a Charcoal Block. These items open up a series of experiments of outstanding interest. There is also an extension for use on the Evaporating Stand, to which apparatus can be readily fitted on similar lines to those adopted by actual chemists ... ... Price **25/-**

No. 3B Meccano Kemex Outfit

This is exactly the same as the No. 3L Meccano Kemex Outfit, except that a highly efficient Bunsen Burner, with the necessary length of rubber tubing, is included in place of the Spirit Lamp ... Price **25/-**

The apparatus included in Meccano Kemex Outfits and refills of Kemex chemicals can be obtained separately. Ask your dealer for the leaflet giving a list of Kemex parts and their prices, or write for a copy to the address given below.

MECCANO LTD., Binns Road, LIVERPOOL 13

A Minute I Shall Never Forget

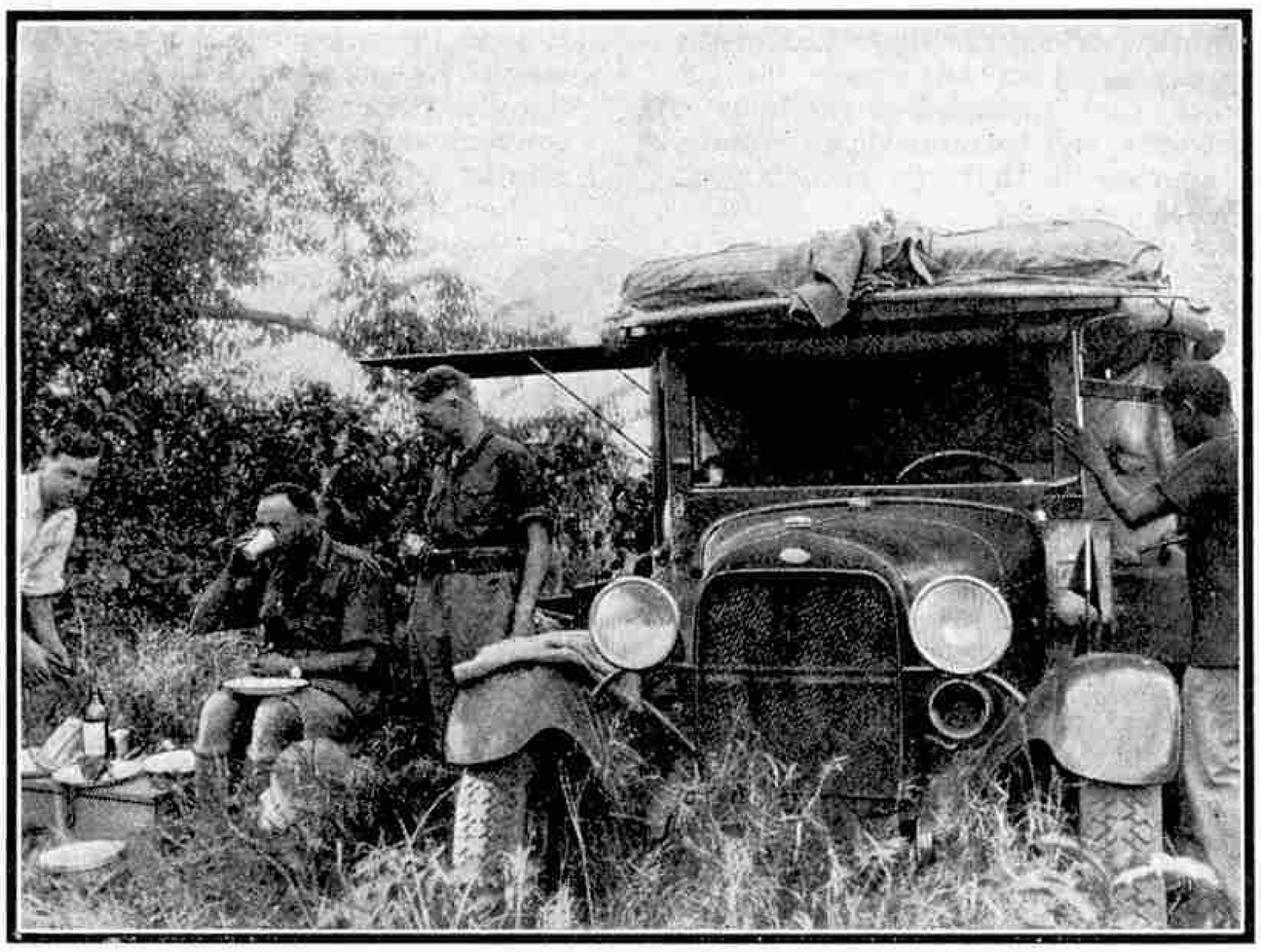
By Commander Attilio Gatti

DURING my stay in the Lukanga country on my last expedition from Cape to Cairo I met a Dutch hunter who invited me to go with him on a buffalo hunt. I learned later, to my disgust, that this individual followed the unsavoury profession of slaughtering wild animals to sell their flesh to the natives in the mines. When I met him he seemed a pleasant-enough chap, however, and I accepted his invitation with alacrity.

We set out at once on foot followed by native gun-bearers, and after an hour's march came in view of a wide stretch of plain covered by reeds, which during the day was the resting place of a huge herd of some 500 buffaloes. A small river about thirty feet wide crossed the plain at this point, and my companion posted me on one bank behind an immense antheap.

"You stay there," he told me in quite a dictatorial tone, "and I'll go on the other side of the stream. In about ten minutes the herd will come out to drink."

I did not relish his air of command, but it was too late to protest, for he hurried away to cross the river, wading through the water, which came up to his shoulders.



A short halt for lunch, on our way to the Lukanga swamps.

Ten minutes, half an hour, passed without a single buffalo putting in an appearance, and without my being able to discover where the hunter had stationed himself. The longer I waited, the more distasteful it seemed to me to stay comfortably hidden until the animals came peacefully down to drink and then shoot them from ambush. So, finally, I stepped out from behind the antheap, handed my rifle to my boy, and started to walk toward the reeds, calmly filling my pipe with no sense of impending danger.

Then, suddenly, I heard a far thundering, and the ground trembled beneath my feet. The curtain of reeds parted violently, and in an instant the horizon seemed filled with hundreds of huge animals trotting in my direction.

"Rifle," I said, stretching out my hand and keeping my eyes fixed on the buffaloes.

"Hey, give me that rifle," I repeated. Hearing no answer of any kind I looked behind me. My boy was running away, had reached the edge of the stream and was about to cross it. I yelled at him. He hesitated for a moment, then threw the rifle on the ground and jumped into the water.

Bang! Bang! Bang! Three shots, one after another, sounded near me. A furious bellowing answered from the herd, and I saw a big bull fall to his knees. Two others jumped high in the air and then started at a quick gallop, followed by the whole grand mass of powerful brutes.

I started running toward my rifle, when two other shots came from the other side of the stream. And in that second I fell flat on the ground with a violent pain in my left foot. My first thought, of course, was that I had been hit by a bullet, but I found that I had stepped into a hole in the ground, spraining, or perhaps breaking the bone of my ankle.

I made a desperate effort to get up, but although the rifle and the river were less than thirty yards from me, and that oncoming sea of horns provided me with plenty of impetus, my foot refused to support me.

Bang! Bang! The shots meanwhile continued. Had he gone crazy, that Dutchman, or was he trying to save me? I managed to stand on my right foot and waved my arms in the air to show him where I was, meanwhile shouting at the top of my lungs in the hope of frightening the buffaloes, who were now about fifty feet from me.

Forty—thirty feet, and I saw the leaders lower their big crooked horns in a fine position to gore me. I shouted and waved my arms more than ever, but I must confess I closed my eyes, sure that it would soon all be over for me.

That was a minute I shall never forget!

Then I felt encompassed by noise, dust, movement, and an acrid odour. I opened my eyes, and nearly lost my equilibrium at the dizzy passage of heavy bodies that almost brushed me on either side. Others and others followed, but at the shouting and gesturing I continued instinctively to make, they snorted when they reached a point some ten or twelve feet from me, and swerving sharply to the left or right, swept past me.

At last the crazy charge was over, and a quick glance around showed me the big cloud of dust rolling on and several huge bodies stretched immobile on the ground. Sick at the sight of the poor animals butchered by that Dutchman, I hopped on my one good foot to the edge of the river.

Using my rifle as a cane I made all haste to cross before the buffaloes could circle around and return to the spot.

CHEMICAL CONJURING TRICKS

THE Kemex enthusiast can easily earn the reputation of a conjurer, for his knowledge of chemistry and the resources of his Kemex Outfit enable him to accomplish many changes that are mysterious to those who know nothing of this interesting hobby. Several attractive chemical conjuring tricks are described in the Kemex Manuals. Others were explained in an article on *"A Chemical Conjuring Entertainment"* that appeared in the issue of the *"M.M."* for December of last year, and this month we propose to give a further selection of experiments that can be described as chemical magic.

The chemical part of each trick described is simple, and no special devices other than Kemex parts are required; but careful preparations of course must be made beforehand. It is advisable to conceal some of the operations, and for this reason large glass jars, such as 4-lb. or 2-lb. jam jars, containing coloured liquids, should be placed on the table used for the display in order to provide a screen. Suitable liquids for this purpose include blue and red litmus solutions, prepared by adding a little ammonia and Sodium Bisulphate respectively to equal portions of the solution made by boiling a few measures of litmus with a test tube full of water. This solution is divided between the two jars, which are nearly filled with water, and the required chemical added in each case. An attractive air of mystery is given also by displaying chemical gardens, the making of which is fully described in the Kemex Manuals; and by the inclusion of a wide-necked flask, mounted on the universal stand, in which a coloured liquid such as red litmus solution is boiled. Attention can be drawn to the boiling litmus solution by pouring in a little more water when it is necessary to divert the attention of the audience. Mysterious apparatus of course is expected in a display by a chemist, and in this manner can be useful for purposes of concealment.

A point that should be emphasised is the need for careful rehearsal of all tricks in order to ensure that the experimenter fully understands the changes he brings about and does not become confused. This precaution also enables him to calculate the times to be allowed for various effects to be produced, and to think out suitable chatter to fill any gaps, or to lead naturally from one trick to another.

The first trick to be described is startling to those who have no knowledge of chemistry. The conjurer exhibits two cards, which may conveniently be about 4 in. square, on one of which a name has been written, the second appearing blank; and announces that he will make the name travel from one card to the other. He presses wet blotting paper on the card on which the name is shown. The writing disappears, and is then reproduced on the blank card by pressing it in a similar manner with blotting paper.

The only piece of trickery involved in this startling experiment concerns the blotting paper, for two separate pieces are required and the change is made secretly. The first piece is soaked in a strong solution of washing soda crystals formed by dissolving as much of this as possible in a test tube full of water. The solution is prepared beforehand and placed in readiness in a small glass jug, and if the chemist describes it as water none of the members of his audience is likely to contradict him. This piece of blotting paper is used for removing the name from the first card. When it has served its purpose it is dropped behind the screen of coloured liquids, preferably into a small box that is closed at the first convenient opportunity; and replaced by a second piece soaked in a solution of Iron Alum prepared by dissolving three measures of the chemical in half a test tube full of water. This solution can be kept in a shallow saucer with the piece of blotting paper lying in it ready for use, and the box already referred to is a good place in which to conceal it from view. Care must be taken to have the two pieces of the same size and colour in order to prevent detection of the substitution.

The "ink" used in writing the name on the first card is blue, and is made by mixing solutions of Iron Alum and Sodium Ferrocyanide, prepared in each case by dissolving three measures of the chemical in about a third of a test tube full of water. If the experimenter wishes he can place some of this in a small ink bottle and actually write the name on the card in full view of his audience. If he does this he should outline the name in pencil, for reasons that will soon be apparent. The second card only seems to be blank, for the name is written on it in a portion of the Sodium Ferrocyanide solution. When this dries the writing on the card is practically invisible, and certainly cannot be seen by an audience in front of the experimenter. This card must be prepared in advance, and the utmost care should be taken to ensure that the writing or printing on it is exactly the same in form as that on the first card.

"Writing in blood!" A startling trick that forms an effective feature of a Kemex conjuring entertainment.

The trick itself is carried out by lifting up the first card, on which the name is written visibly in blue "ink," and pressing on it the first sheet of blotting paper, which has been dipped in washing soda solution. This is kept in contact with the card for about a minute. The exact time depends on the strength of the solutions, and can readily be gauged during rehearsal. On removing the paper the card is seen to be blank, and while it is being displayed to the audience the blotting paper is quietly dropped. The second card is now picked up, together with the piece of blotting paper soaked in Sodium Ferrocyanide solution; and when the two are pressed together the name is reproduced in its original colour, because the Sodium Ferrocyanide acts on the Iron Alum already on the card to form "ink" of exactly the same kind as that used in writing on the card first shown.

In a long entertainment other tricks making use of Sodium Ferrocyanide and Iron Alum can be carried out with the solutions already prepared. One of these is the Magic Brush experiment explained in the December 1933 issue of the *"M.M.,"* which is always spectacular and effective, and others will be found in

the Manuals that are included in the Kemex Outfits.

Writing or drawing in water is remarkably simple, both in appearance and from a chemical point of view, but always arouses wonderment. One good way of effecting this is to rub a mixture of two measures of Tannic Acid and two of Iron Alum into a sheet of paper. The chemicals should be thoroughly dried by pressing them between blotting paper and leaving them in a warm place, and after careful mixing are rubbed well into a sheet of writing paper with the aid of a pad of blotting paper. The papers employed should also be thoroughly dried beforehand. The writing can be carried out with a pen or a match stick dipped in water. If a member of the audience is asked to obtain the water the entertainer can point out that he is using no secret liquids, but of course he should carefully avoid revealing the fact that the paper is prepared.

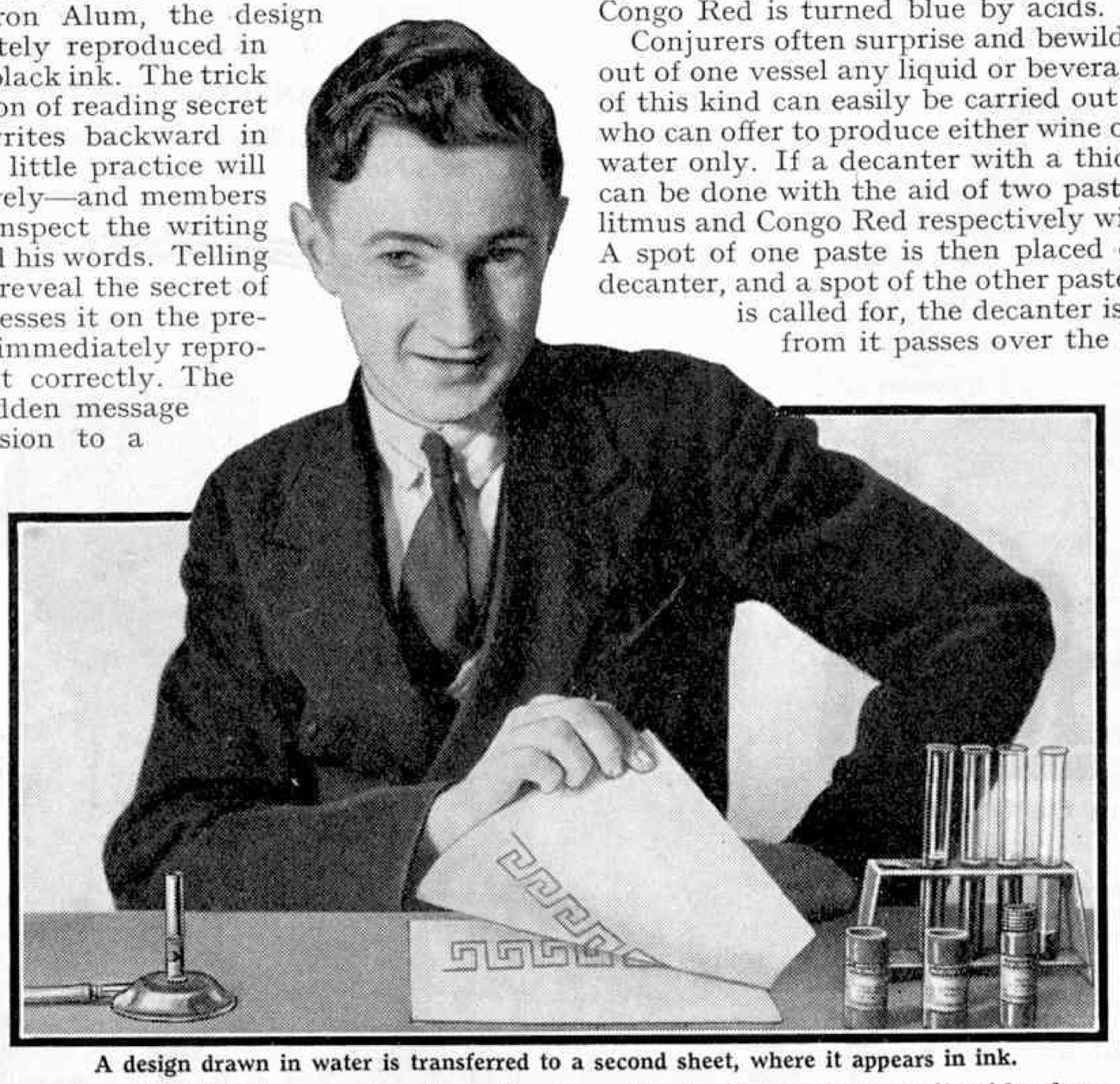
This mixture gives a black ink containing Iron Tannate. A blue ink is produced if Sodium Ferrocyanide is substituted for the Tannic Acid, and a mixture of Iron Alum and Sodium Thiocyanate will give a red ink. Papers prepared with the three mixtures should be kept in readiness, and each should be picked up in turn in giving a complete demonstration of writing in different colours with water. A clean pen should be used in each case.

Dyeing a piece of white cloth first red and then blue by steeping it in colourless liquids.

A very effective form can be given to this trick by drawing with water on a blank sheet of paper and laying this on the sheet covered with the mixture of chemicals. If the mixture used is Tannic Acid and Iron Alum, the design drawn in water is immediately reproduced in reverse on the second sheet in black ink. The trick can be used as a demonstration of reading secret writing. The experimenter writes backward in water on the plain paper—a little practice will enable this to be done effectively—and members of his audience invited to inspect the writing probably will be unable to read his words. Telling them that he is now going to reveal the secret of his mysterious message, he presses it on the prepared paper, and there it is immediately reproduced so that all can read it correctly. The effect is heightened if the hidden message contains some personal allusion to a member of the assembly.

Paper covered in the manner already described with a mixture of Iron Alum and Sodium Thiocyanate can be used for a startlingly effective trick. The finger is dipped in water and used as a living pen to write on the paper, where it produces letters that can be described as written in blood!

A good trick that can be interposed at this stage is that of forcing an egg to pass through the neck of a bottle that is obviously too small for it. The secret of this trick consists of preparing the egg. The shell is naturally fragile and easily broken, but if the egg is allowed to stand in vinegar for about a day the shell becomes elastic. If it does not, the egg should be placed in fresh vinegar for a further period. It can then be pushed through the neck of the bottle, and when it is inside it returns to its normal shape. An elastic egg is easily broken and should be handled with great care.



A design drawn in water is transferred to a second sheet, where it appears in ink.

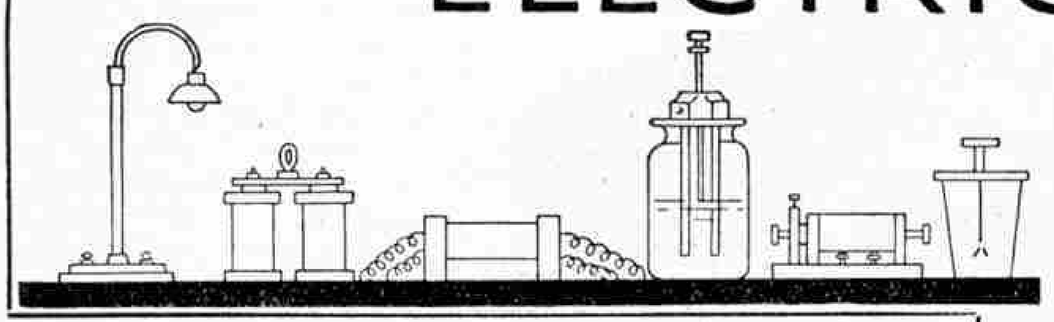
A piece of white cotton can be dyed first red and then blue by dipping it into colourless liquids. To the chemist there is nothing very mysterious in a feat of this kind, but its effect on other people is remarkable, and the experiment can be profitably included in a display of chemical conjuring. The colourless liquids required are three in number, and resemble water in appearance. They are solutions of Iron Alum, Sodium Thiocyanate and Sodium Ferrocyanide, of the strengths previously referred to; and they can conveniently be prepared in evaporating basins or small saucers placed in a row in the order named. A strip of white cotton 4 in. long and 2 in. wide is suitable for use with evaporating basins. It is held by one end and lowered into the first basin, containing Iron Alum solution, a glass rod being used to push it into the liquid in order to soak it through. It is then lifted out and allowed to drip for a moment before dipping it into the second basin, which contains Sodium Thiocyanate. It immediately becomes bright red, as can be seen when it is held up for inspection; and on plunging it into the third colourless liquid it becomes blue.

An even more startling effect can be produced with the aid of a strip of filter paper or blotting paper that has been dipped in Congo Red solution and allowed to dry. For the trick it is placed in a test tube containing litmus solution to which sufficient acid or Sodium Bisulphate has been added to give it a distinctly red colour. When the paper is dipped in this liquid it is surprisingly turned blue in colour, an entirely opposite effect from that expected by members of the audience. The explanation of course is that Congo Red is turned blue by acids.

Conjurers often surprise and bewilder their audiences by pouring out of one vessel any liquid or beverage they are asked for. A trick of this kind can easily be carried out by the Kemex experimenter, who can offer to produce either wine or ink from a vessel containing water only. If a decanter with a thick lip or top is available, this can be done with the aid of two pastes made by mixing powdered litmus and Congo Red respectively with a drop or two of glycerine. A spot of one paste is then placed on one side of the lip of the decanter, and a spot of the other paste on the opposite side. If wine is called for, the decanter is turned so that water flowing from it passes over the Congo Red on its way into a tumbler placed to receive it. If ink is desired, the decanter is turned round so that the water flows over the spot of litmus. The changes in the position of the decanter must of course be carried out naturally and easily, and usually questions from the audience and replies of the entertainer give ample opportunity for this. Needless to say, the "ink" and "wine" produced in this experiment are not real, and efforts to treat them as genuine should be discouraged!

If a suitable decanter cannot be obtained, the spots can be placed on the first and second fingers of the right hand, the required finger being placed momentarily in the stream of liquid when the water is poured out. The wide-necked flask or a similar vessel can then be used, and with a little care the colour can be introduced without anyone noticing what is being done. If some crushed washing soda is then dropped into the remaining water, and this is well shaken, a further supply of "wine" can be poured out into a glass that has been wetted with Phenolphthalein Solution.

MECCANO ELEKTRON ELECTRICAL OUTFITS



In these days of radio, X-rays, and electric trams and trains, every boy should have a knowledge of electricity. The only way to gain this knowledge is by means of experiments, and the Meccano Elektron Outfits have been produced specially for this purpose.

These Outfits contain all the materials for carrying out a splendid series of fascinating experiments, commencing with Magnetism and passing on through Frictional Electricity to Current Electricity. In addition many interesting mechanisms can be constructed, including an Electric Bell, a Telegraph, and a Shocking Coil.

No. 1 Meccano Elektron Outfit Price 6′6

No. 2 Meccano Elektron Outfit Price 21′-

No. 1 MECCANO ELEKTRON OUTFIT

Magnetism and Static Electricity

The No. 1 Outfit contains two powerful Bar Magnets and a reliable Magnetic Compass, together with everything necessary for the carrying out of a series of fascinating magnetic experiments. In addition there are materials for experiments in frictional or static electricity, and for the construction of an Electric Compass and two forms of Electroscope.
Price **6/6**

No. 2 MECCANO ELEKTRON OUTFIT

Magnetism, Static and Current Electricity

The No. 2 Elektron Outfit contains all that is included in the No. 1 Elektron Outfit, with additional parts that enable a splendid series of experiments in current electricity to be performed. Among these parts are a Horseshoe Magnet, and Coils and Yokes for the construction of Electro-Magnets that can be used in building a real Electric Bell, and a Buzzer for use in an electric telegraph system. Price **21/-**

No. 1A MECCANO ELEKTRON ACCESSORY OUTFIT

An Accessory Outfit is also available that converts a No. 1 Elektron Outfit into a No. 2. Price **14/6**

The parts included in the Elektron Outfits can be obtained separately. Ask your dealer for the Elektron Folder giving a list of Elektron parts, or write for a copy to the address below.

Manufactured by

MECCANO LTD.

BINNS ROAD

LIVERPOOL 13

THE MOST WONDERFUL FORCE OF THE AGE!

PRODUCT of MECCANO LIMITED LIVERPOOL

Development of the Railway Ticket

Edmonson's Far-Reaching Inventions

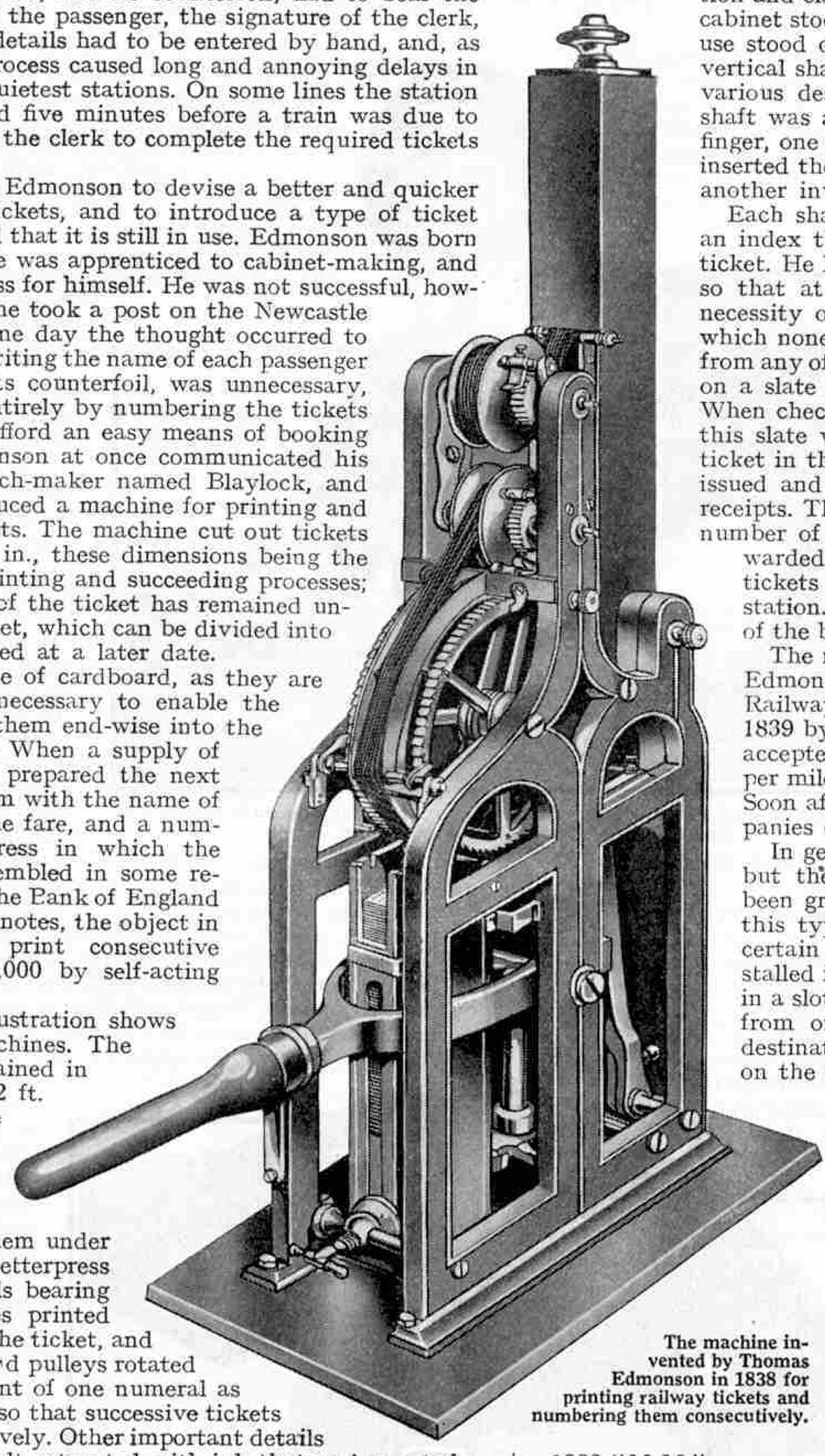
By Capt. E. A. Humphery Fenn, F.R.G.S.

IN the early days of railways the tickets were prepared by hand for individual passengers as they came along. This simple but inevitably slow method worked well enough while the numbers of passengers remained small, but trouble arose when the public began to take seriously to railway travelling towards the middle of last century. On the Stockton and Darlington Railway, for instance, each ticket issued, and its counterfoil, had to bear the destination, the name of the passenger, the signature of the clerk, and the date. All these details had to be entered by hand, and, as may be imagined, the process caused long and annoying delays in booking at all but the quietest stations. On some lines the station doors were always closed five minutes before a train was due to leave, in order to enable the clerk to complete the required tickets in time.

It was left to Thomas Edmonson to devise a better and quicker way of preparing the tickets, and to introduce a type of ticket that proved so successful that it is still in use. Edmonson was born at Lancaster in 1792. He was apprenticed to cabinet-making, and later he set up in business for himself. He was not successful, however, and subsequently he took a post on the Newcastle and Carlisle Railway. One day the thought occurred to him that the labour of writing the name of each passenger on his ticket, and on its counterfoil, was unnecessary, and could be avoided entirely by numbering the tickets consecutively so as to afford an easy means of booking the number sold. Edmonson at once communicated his idea to a friend, a watch-maker named Blaylock, and with his assistance produced a machine for printing and numbering railway tickets. The machine cut out tickets measuring 2¼ in. by 1¼ in., these dimensions being the most suitable for the printing and succeeding processes; and the shape and size of the ticket has remained unchanged. The return ticket, which can be divided into two parts, was introduced at a later date.

The tickets were made of cardboard, as they are to-day; stiffness being necessary to enable the booking clerk to insert them end-wise into the date stamping machine. When a supply of blank tickets had been prepared the next process was to print them with the name of the station, the class, the fare, and a number. The Edmonson press in which the tickets were printed resembled in some respects the press used in the Bank of England for printing numbers on notes, the object in both cases being to print consecutive numbers from 1 to 10,000 by self-acting mechanism.

The accompanying illustration shows one of Edmonson's machines. The blank tickets were contained in an upright tube about 2 ft. high at the rear of the machine. A feed mechanism at the base of the tube withdrew the tickets one at a time, and passed them under type that printed the letterpress matter. Two type wheels bearing numerals on their edges printed a number on the end of the ticket, and a set of ratchet wheels and pulleys rotated these wheels to the extent of one numeral as each ticket was printed, so that successive tickets were numbered consecutively. Other important details were a narrow endless belt saturated with ink that moistened the face of the type before each printing, and the pressure table that pressed the ticket against the type. The whole of the apparatus was worked by a hand lever, each stroke of which produced a printed and numbered ticket, and discharged it into a receptacle below. When a sufficient number of tickets for any one destination had been printed they were placed in a drawer of a large cabinet divided into sections for each destination, and into sub-divisions for each class. The tickets thus prepared were afterwards distributed to the booking offices of the various stations.



The machine invented by Thomas Edmonson in 1838 for printing railway tickets and numbering them consecutively.

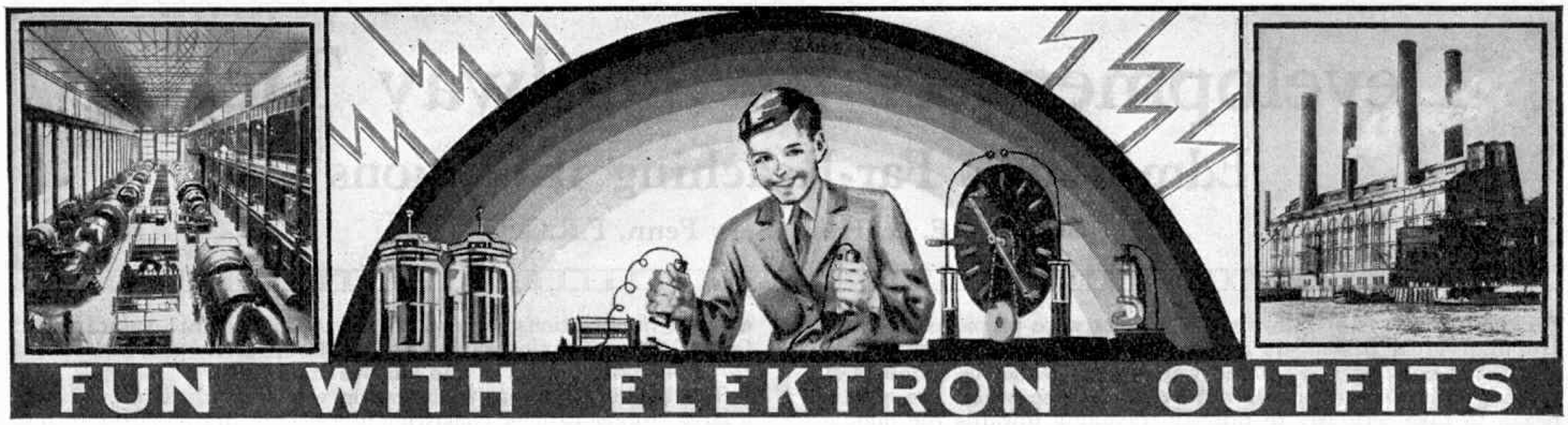
The booking office at each station was similarly equipped with a large storage cabinet consisting of a nest of drawers divided into compartments for each destination and labelled with the destination and class of the tickets they contained. A smaller cabinet stocked with a supply of tickets for immediate use stood on the counter. It consisted of a series of vertical shafts into which the packs of tickets for the various destinations were set. At the base of each shaft was an opening through which, by applying a finger, one ticket could be withdrawn. The clerk then inserted the ticket in a small date-stamping machine, another invention by Edmonson.

Each shaft of the counter cabinet had at its base an index that the clerk raised on first taking out a ticket. He left raised the index of every shaft he used so that at the end of the day he was spared the necessity of counting the tickets of a column from which none had been issued. On first taking a ticket from any of the shafts the clerk wrote down its number on a slate fixed in front of the withdrawal opening. When checking up later he compared the number on this slate with the number on the bottom unissued ticket in the shaft, calculated the quantity of tickets issued and was able to compare it with the cash receipts. The clerk had to make a daily return of the number of tickets issued by him, and this was forwarded to the head office, together with the used tickets collected from passengers arriving at the station. By this means a strict account was kept of the business done.

The new railway ticket system was adopted by Edmonson's employers, the Newcastle and Carlisle Railway, in the autumn of 1838, and in April, 1839 by the Manchester and Leeds Railway, who accepted the inventor's terms of 10/– per year per mile of road over which the tickets were used. Soon afterward most of the leading railway companies of that day adopted the new system.

In general Edmonson's methods still hold good, but the output of railway ticket machines has been greatly increased, and a modern machine of this type can print 10,000 tickets per hour. At certain busy stations automatic machines are installed in which the passenger puts a coin or coins in a slot and obtains his own ticket, all the tickets from one machine being printed for the same destination. The booking halls of the seven stations on the City and South London underground line from Clapham Common to Morden are equipped with "Passimeter" booking-booths fitted with machines that automatically print and issue a ticket. These machines are a feature of other large "Underground" stations. With the reconstruction of Piccadilly Circus and Charing Cross some years ago, the opportunity was taken to instal automatic ticket machines in order to aid and speed up the handling of the crowds using these stations. Automatic ticket machines are provided also at the stations on the Cockfosters extension of the Piccadilly Tube line that was described in the April 1933 *"M.M."*

The first "Passimeter" booking and ticket collecting office in the North of England was that opened in 1929 at the L.N.E.R. station at Manors East, Newcastle-on-Tyne. During the course of a year over 100,000 tickets are issued and over 200,000 are collected at this station, which is served by suburban electric and main line trains.



ELECTRICAL TRICKS AND RECREATIONS

ELECTRIC forces can be used in experiments that may almost be described as conjuring tricks, for these forces are invisible and thus give an air of mystery to many changes that in reality are very simple. Owners of Elektron Outfits can perform many experiments of this kind. Simple magnetic and electric tricks have been described in previous articles in this series and this month we explain how to make other experiments that will provide interest and amusement for the experimenter himself and for his friends, who will be greatly mystified if their knowledge of electricity is limited.

Experiments in which electric sparks are obtained are always of special interest, and a simple but effective one can be carried out readily with very simple means. A sheet of brown paper about 1 ft. square is thoroughly brushed in one direction with a stiff brush to electrify it. The Copper Plate, Part No. 1526, is then carefully dropped on the middle of it, and on this is placed the Compass Mount and Pivot, Part No. 1502, care being taken not to touch the Copper Plate or paper while this is being done, or to retain contact with the Compass Mount and Pivot when this touches the Copper Plate. Presenting the knuckle of a finger to the point of the Compass Pivot then yields a spark.

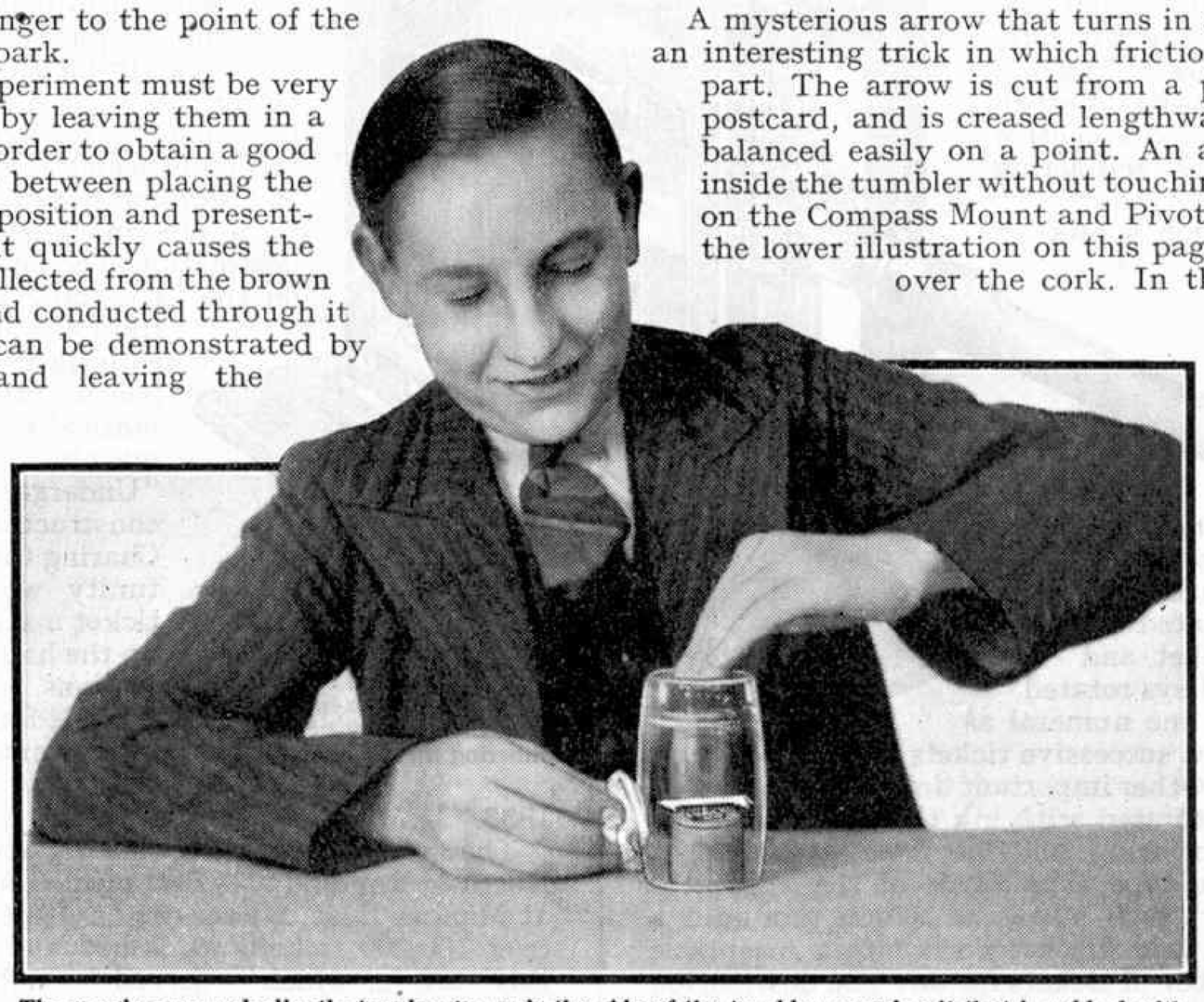
Drawing electric sparks from a point. The electricity for this experiment is produced by vigorously brushing a sheet of brown paper.

All the materials for this experiment must be very thoroughly dried beforehand by leaving them in a warm place for some time. In order to obtain a good spark there must be no delay between placing the Compass Mount and Pivot in position and presenting the knuckle, for the point quickly causes the dissipation of the electricity collected from the brown paper by the Copper Plate, and conducted through it to the Compass Pivot. This can be demonstrated by repeating the experiment and leaving the charged apparatus untouched for a few minutes. No spark is then obtained on presenting the knuckle.

The power of points of this kind to bring about electrical discharge is very useful. The action of a lightning conductor depends upon the discharging action of a point, for when a cloud charged with positive electricity approaches a building provided with a well-earthed conductor, the negative electricity attracted by it leaks harmlessly away at the point. Thus there is quiet neutralisation instead of a violent flash of lightning. In addition the lightning conductor offers a direct and easy path to earth if the building itself is the centre of a lightning discharge. Points also attract electricity, and that produced by an electrical machine is collected by means of combs consisting of rows of points directed towards those parts of the machine that become electrified during its operation.

A spark also can be obtained from an electrified sheet of brown paper by dropping on to it a large metal object such as a key, and bringing near this the knuckle of one finger. In all experiments of this kind the length of the spark depends on the care with which the materials have been dried, and also on climatic conditions. The longest sparks are obtained in dry frosty weather, for moisture in the atmosphere reduces the efficiency of the apparatus. This of course is true of all experiments in frictional electricity, including the well-known one in which a cat is stroked or brushed the wrong way. The cat's fur then becomes electrified and a faint crackle of sparks can be heard as the hand is passed over it. In some cases a spark actually can be drawn from the creature's nose by bringing the end of the finger near it.

A mysterious arrow that turns in any desired direction provides an interesting trick in which frictional electricity plays the chief part. The arrow is cut from a piece of thin card, such as a postcard, and is creased lengthways in order to enable it to be balanced easily on a point. An arrow of suitable length to fit inside the tumbler without touching the glass is cut and balanced on the Compass Mount and Pivot placed on a cork, as shown in the lower illustration on this page. The tumbler is then placed over the cork. In this position it effectively cuts off the arrow from the experimenter, who directs it as he pleases by stroking the outside of the tumbler with the silk square at the position to which it is to point. This has the effect of electrifying the glass. The pointer then swings round owing to electrical attraction, and comes to rest with the arrow head pointing towards the part of the glass that has been rubbed.



The magic arrow obediently turning towards the side of the tumbler covering it that is rubbed with a piece of silk.

A magic arrow of this kind is remarkably docile under the influence of the invisible electrical force, especially when the precaution already suggested is taken of thoroughly drying all the materials, in-

including the cork, which insulates the arrow and its supports.

Electricity can be used in another interesting trick of a similar kind to that just described. The narrow end of a small cork is cut to form a blunt ridge about $\frac{1}{8}$ in. in width on which a Glass Rod can be balanced. Onlookers are then challenged to make the Glass Rod fall without touching it, causing it to vibrate by banging on the table, blowing it, or using any other visible or material means.

When every possibility has been canvassed, this trick will be found impossible except with the aid of electricity. A second Glass Rod is electrified by rubbing it with silk, and on bringing its end near that of the balanced Rod, this will be disturbed by the electrical forces exerted, and can be swung round until it loses its balance. The experiment becomes even more interesting when a clay pipe is substituted for the balanced Glass Rod, and of course an electrified Ebonite Rod, or even a fountain pen rubbed on the coat sleeve, can be used to disturb its balance.

Any amount of fun can be obtained with the aid of a simple microphone, and a suitable type that can be made and used by any Elektron experimenter is shown in the upper illustration on this page. It is constructed by pushing pieces of carbon rod about 2 in. in length through holes an inch apart in the wide face of an empty match box. A box made from very thin wood is better than one of cardboard, for this part of the microphone is intended to act as a sounding board and wood is better in this respect than cardboard. Suitable carbons are easily obtained from old dry batteries. They are thoroughly cleaned and a slight conical dent is bored into each at a point about $\frac{1}{2}$ in. from the end that is to project above the match box. The two rods are fixed in position with the holes opposite each other, and a narrower rod, also of carbon and with sharpened ends, is then placed between them with its points resting in the two tiny holes, where it is held lightly, and not tightly gripped. The lead from a good blacklead pencil also would serve for this part of the microphone.

The ticking of a watch transmitted by means of a simple microphone and a pair of headphones.

To complete the equipment the bared ends of lengths of copper wires are twisted tightly round the feet of the upright carbon rods in order to enable electrical connections to be made to them. The opposite ends of these wires are connected respectively to one terminal of the Elektron Bichromate Cell and to one terminal of a pair of headphones, or an ordinary telephone receiver. The electrical circuit is then completed by joining the free terminal of the headphones or telephone to the remaining terminal of the Bichromate Cell.

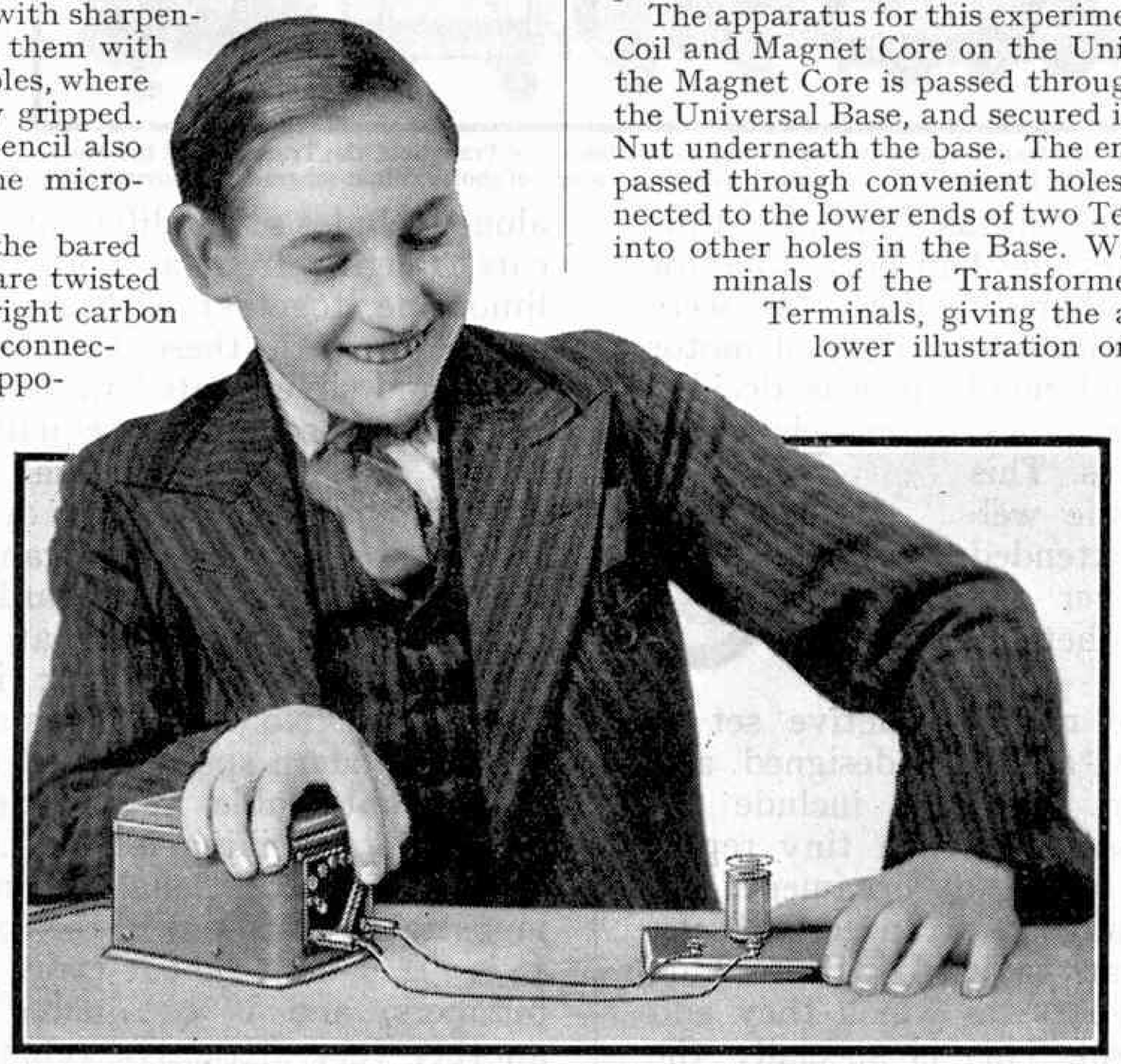
When the horizontal carbon rod is disturbed by sound waves striking it, it vibrates and the pressure of its ends on the upright rods varies. The resistance offered at these points to the passage across them of the electric current also varies, causing the magnitude of the current in the circuit to change. The effect of this is readily detected by the telephone, for variations in the strength of the current passing through the windings of this receiver cause its diaphragm to vibrate and to reproduce the original sound waves. Thus sounds can be transmitted electrically. For instance the ticking of a watch held on the soundbox of the microphone can be heard distinctly by means of telephones at distances to which the sound itself cannot penetrate.

The greatest amount of fun with a microphone of this type can be obtained by replacing the telephones with the gramophone pick-up plug of a wireless receiver. The variations in the strength of the current in the microphone circuit are then amplified in the receiver and the sounds causing them are reproduced by the loud speaker. Thus what may be described as a private broadcasting station can easily be established. Words or music or other sounds picked up by the microphone in one room can be reproduced by the wireless set in another, and as the entire outfit is self-contained, and causes no radiation, there is no interference with other wireless users. A higher voltage will be necessary if the connecting wires are long, and another Elektron Bichromate Cell can then be placed in series with the one already included in the circuit, or a flash-lamp battery can be used. A few experiments will show what voltage gives the best results.

The possibilities of this plan for good fun are almost unlimited. A carefully organised imitation broadcasting entertainment can readily be given in circumstances that will deceive many listeners, and ample opportunity will be given to humorists to exercise their peculiar gifts at parties and on other festive occasions.

When a magnet is mentioned most people immediately think of attractions, because their experience of magnetic forces is limited to the action of an ordinary bar or horseshoe magnet, or perhaps an electro-magnet, on pieces of iron and steel. They know that such a magnet does not attract copper, aluminium and other metals, but they would be surprised to learn that in certain cases a magnet actually can be made to bring about repulsion. An experiment in which this effect can be seen is readily carried out with Elektron parts by an experimenter who is the possessor of a 6-volt Meccano Transformer.

The apparatus for this experiment is fitted up by placing a Magnet Coil and Magnet Core on the Universal Base. The threaded end of the Magnet Core is passed through a suitable hole in the middle of the Universal Base, and secured in the usual manner by means of a Nut underneath the base. The ends of the windings of the Coil are passed through convenient holes in the Universal Base and connected to the lower ends of two Terminals fitted in the usual manner into other holes in the Base. Wires leading from the output terminals of the Transformer are then connected to these Terminals, giving the apparatus the form shown in the lower illustration on this page. The Transformer of course is supplied with current from alternating current mains. That from direct current mains is unsuitable for this experiment and current from an accumulator or voltaic cell also cannot be used.



A magnetic surprise. A ring of aluminium is repelled by an electro-magnet actuated by alternating current.

A ring of the same size as the end of the Magnet Coil is then cut from the sheet of Aluminium Foil, Part No. 1525, the hole in the centre being of about the diameter of the Magnet Core. This ring is placed on top of the Magnet Coil, and current from the transformer is switched on. The ring is immediately repelled by the action of the electro-magnet, and is either thrown right off the Magnet Coil, or made to dance up and down in a curious and amusing manner. The alternating current should only be passed through the windings of the Magnet Coil for short periods in order to prevent overheating.

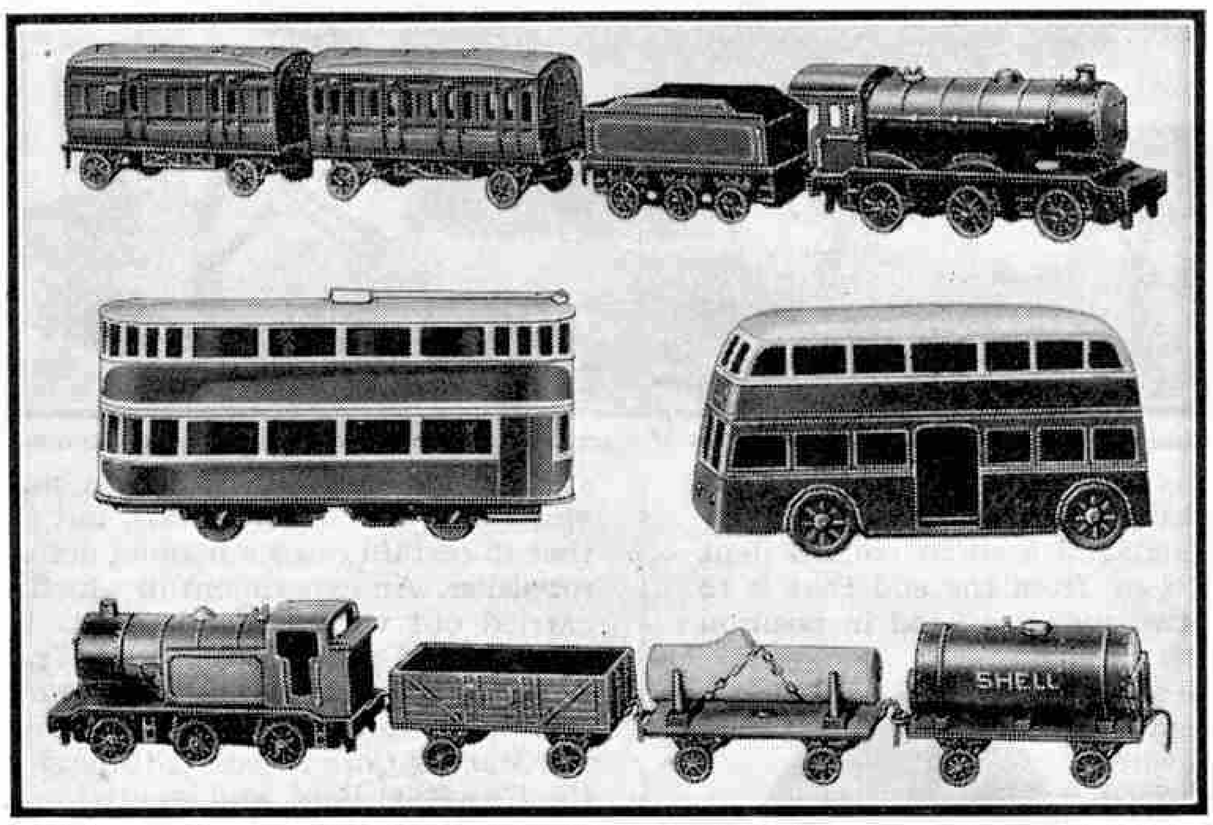
The explanation of this experiment is that eddy currents are induced in the aluminium ring and the direction of these always is such that the magnetic field they produce is in the opposite sense to that produced by the currents in the windings of the Magnetic Coil that induce them. The result is electro-magnetic repulsion.

Collecting Meccano Dinky Toys

A New and Fascinating Hobby

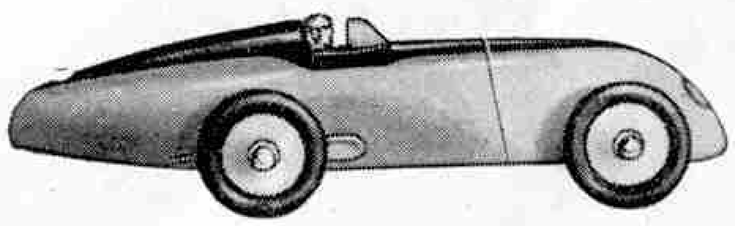
THERE is a peculiar fascination about miniature reproductions of familiar things. We pay little attention to the normal full-sized objects to be seen every day in our streets and elsewhere, but a miniature reproduction of one of them immediately attracts our notice, and most of us feel a desire to possess it!

Some years ago a set of platform accessories—luggage and truck, milk cans and truck, seats, and automatic machines—was introduced with the object of making Hornby Station platforms more realistic. This proved immediately popular, but Hornby Railway owners were not satisfied. They demanded miniature railwaymen and passengers to give "life" to the platforms, and in response to this demand two further sets of figures were produced, one consisting of station staff and the other of typical passengers. Miniature train sets followed, each made up of a locomotive and two or three coaches or goods vehicles.



This illustration shows two of the Meccano Dinky Toy Train Sets, the Tramcar and the Motor Bus. The Racing Car, which is available in a variety of sporty colour schemes, is shown below.

The requirements of railway enthusiasts were thus fairly well provided for, but nothing had been done for those whose interests lay in other directions. We were repeatedly asked for other miniatures, mainly of motor cars, aeroplanes and ships; and finally it was decided to introduce a comprehensive series of models under the general title of Dinky Toys. This series met with an enthusiastic welcome, and it has been rapidly extended until it now includes well over one hundred items, with many others in active preparation.



The Dinky Toys form the most attractive set of miniatures in existence. They are well designed and beautifully finished in colour, and they include the utmost amount of detail possible in such tiny reproductions. All of them form delightful ornaments for table or mantelpiece, especially if arranged in sets. In addition many of them can be used with striking effect in Hornby Railway layouts, to which they add a remarkable touch of realism. This is specially the case with layouts incorporating some of the Countryside Sections. Horses, cattle and sheep can be placed in the fields, and pedestrians and motor vehicles of various types distributed at suitable points along the roads. The effects that can be produced in this manner are quite extraordinary, and the general scheme can be varied almost indefinitely.

With a few exceptions all the Dinky Toys are arranged in sets, but every item can be purchased separately. One of these sets, or even a single model, forms an ideal Christmas present.

The train sets, of which there are four, have already been mentioned, Set No. 17 consists of a locomotive and tender, coach and guard's van, and Set No. 20 of a tank locomotive, two coaches and guard's van. For those who prefer goods trains there are Sets No. 18, consisting of a tank locomotive and three open wagons, and No. 19, comprising a tank locomotive, an open wagon, a petrol tank wagon and a lumber wagon. By purchasing additional coaches or wagons these trains can be increased to quite impressive proportions, and as all the items are to the same scale the trains can be rearranged and made up in any way desired.

Motor car enthusiasts are particularly well catered for. Set No. 24 alone includes seven different types of up-to-date private cars, ranging from a sports two-seater to a handsome limousine, together with a splendid model of a typical ambulance. All these vehicles are fitted with rubber tyres and silver-plated radiators. Then there is Set No. 25, which provides an equally attractive collection of commercial vehicles. There are six of these, an open wagon, a flat truck, a covered van, a petrol tank wagon, a market gardener's van, and a tipping wagon that actually tips!

Another interesting model is the Racing Car (No. 23). This is a realistic little model of a typical modern speed car. It is fitted with rubber tyres and is obtainable in a variety of attractive colours. Even more striking is the "Airflow" Saloon (No. 32). This is an exceptionally handsome model, which demonstrates excellently the principles of streamlining. It is fitted with rubber tyres, silver-plated radiator and bumpers, and is obtainable in various colours. Still another very attractive vehicle is the "Holland Coachcraft" van (No. 31). This is a model of one of the most modernistic commercial vehicles now on the road.

Turning now to aeroplanes, we find six splendid models in Set No. 60. The largest of these is a realistic reproduction of an Imperial Airways liner, which gives a good idea of the massive proportions and handsome appearance of these machines. Smaller but equally

attractive are the models of a D.H. "Leopard Moth," a Percival " Gull," a low wing monoplane, and a General "Monospar." Finally there is a delightful little model of a Cierva "Autogiro." This tiny model, with its revolving vanes, has proved exceptionally popular, which shows clearly not only the high quality of the model, but also the widespread interest that is now being taken in this type of aeroplane.

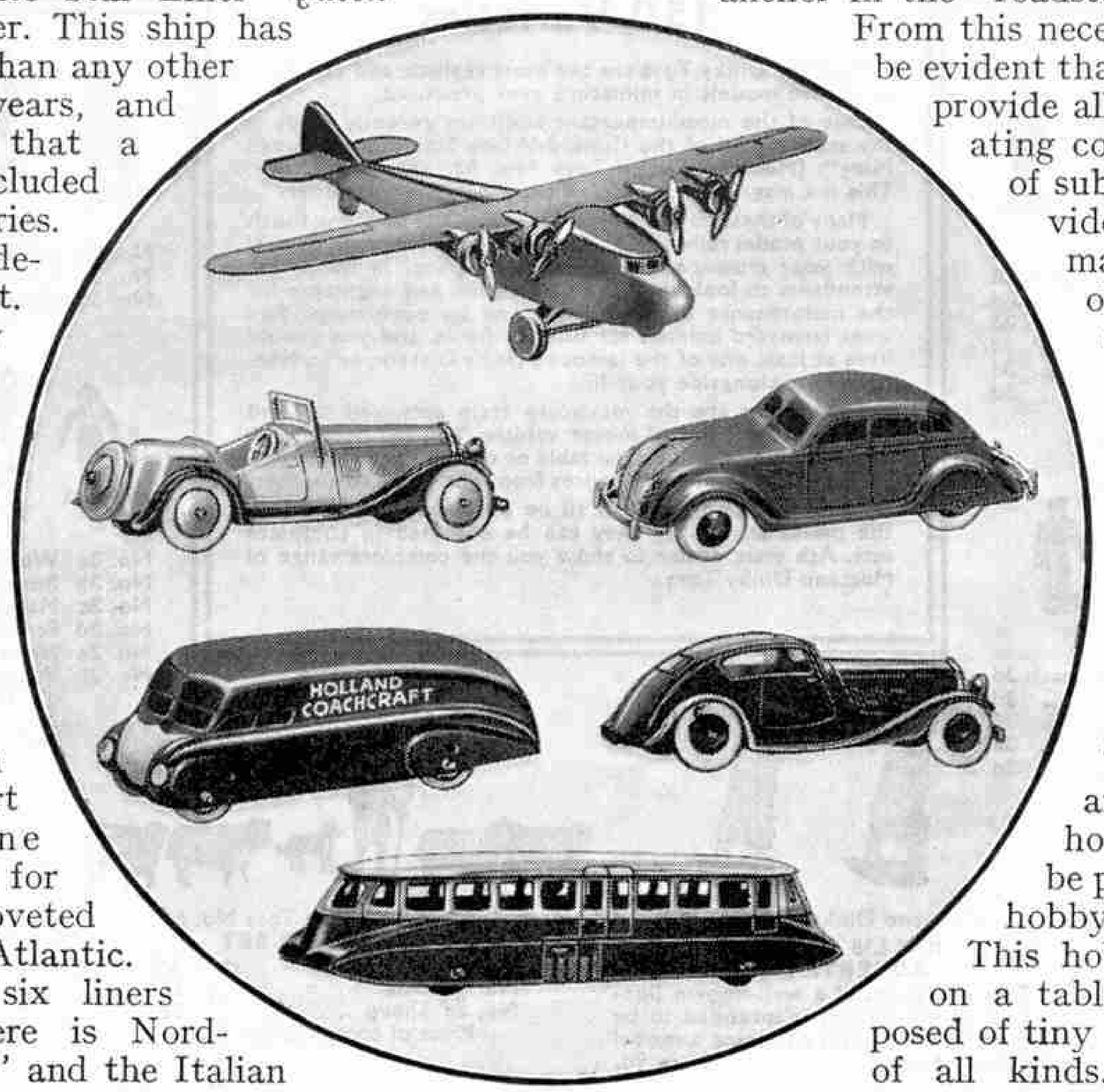
One of the outstanding events of 1934 was the launch of the giant Cunard White Star Liner *"Queen Mary"* on 26th September. This ship has attracted more attention than any other vessel built for many years, and therefore it is fitting that a special model should be included in the Dinky Toys series. This model (No. 52) is designed to a scale of 150 ft. to 1 in., and is nearly 7 in. in length. It contains a surprising amount of intricate detail work, particularly in the boat deck and the superstructure generally. It is finished in correct colours and shows how the real *"Queen Mary"* will appear when she is completed and ready for her maiden voyage in the early part of 1936. Then, everyone hopes, she will recover for Great Britain the much coveted "Blue Riband" of the Atlantic.

Set No. 51 includes six liners of world-wide fame. There is Norddeutscher Lloyd *"Europa,"* and the Italian liner *"Rex,"* which at present holds the Atlantic record with a crossing between Gibralter and New York made in four days 13 hours. Coming now to British ships, there is the C.P.R. *"Empress of Britain,"* the P. & O. *"Strathaird,"* the Furness Withy *"Queen of Bermuda"* and the Cunard White Star *"Britannic."*

All these ships are what are known as "waterline" models; that is to say, they represent the vessel as she appears in the water when loaded down to her normal level. It is impossible to convey in words any adequate impression of the daintiness of these models. They include every detail for which room could be found, and they are beautifully finished in correct colours.

All boys are interested in warships, and Set No. 50 provides a set of ships of the British Navy ranging from battleships to submarines. Heading the Set are the mighty battle cruiser *"Hood"* and the battleship *"Nelson."* Then there are three typical cruisers, *"Effingham,"* *"York"* and *"Delhi,"* and two destroyers of the "Broke" and "Amazon" classes respectively. Smallest of all are models of submarines of the "X" and "K" classes. All these warships are painted in battleship grey, with a dull matt finish that gives a strikingly realistic appearance. Keen boys will appreciate the fact that the gun turrets on the cruisers and battleships, although so small, will actually swivel!

The Dinky Toy ships are just the thing for giving the finishing touches to models of harbours and docks. Large models of this nature are very popular just now with Meccano Clubs, and they look astonishingly realistic with one or two Dinky Toy liners at the quayside. The effect is enhanced by a small fleet of warships lying at anchor in the "roadstead."

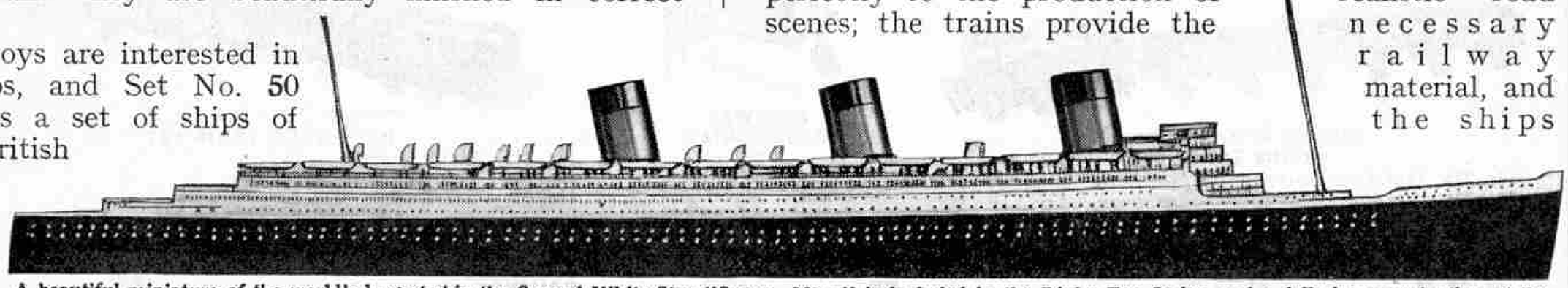


From this necessarily brief survey it will be evident that the Meccano Dinky Toys provide all the material for a fascinating collecting hobby. The range of subjects is so great as to provide ample variety, and as many of the models can be obtained in several different colours, there is scope for an extensive collection of outstanding interest. The Dinky Toys that are now in preparation will be announced in the pages of the *"M.M."* immediately they are available, and collectors should keep a sharp look-out for details.

In next month's *"M.M."* we hope to include an article describing in detail how Meccano Dinky Toys can be put to use in the fascinating hobby of table-top photography. This hobby consists of arranging on a table miniature scenes, composed of tiny models and scrap material of all kinds. These scenes are then photographed, and the results appear as though they were quaint reproductions of real scenes. A great deal of the fun in this kind of photography lies in making use of the simplest of household articles to produce realistic effects, and in next month's article we shall describe some of the unlimited possibilities in this direction.

One difficulty in the past has been that the household material available has usually been seriously deficient in models small enough to be used for the purpose. This problem is now solved by the appearance of the Dinky Toys. The motor cars and wagons lend themselves perfectly to the production of realistic road scenes; the trains provide the necessary railway material, and the ships make it possible to produce harbour or coastal scenes in great detail. The aeroplanes, too, can be made to play an important part, and in the article special reference will be made to their employment.

No doubt keen and enthusiastic readers will discover other interesting uses for the Dinky Toys, and we should be glad to receive descriptions and if possible photographs of any such schemes.



A beautiful miniature of the world's largest ship the Cunard White Star "Queen Mary" is included in the Dinky Toy Series, and a full size reproduction of the model is shown here. Dinky Toy motor vehicles and an Imperial Airways Liner are illustrated at the top of this page.

MECCANO

Toys of Quality

DINKY TOYS

The Best that you can buy

150 Varieties

Meccano Dinky Toys are the most realistic and the most attractive models in miniature ever produced.

One of the most important additions recently made is the scale model of the Cunard-White Star Liner "Queen Mary" (Meccano Dinky Toys No. 52, see page 1000). This is a magnificent model of the world's largest liner.

Many of these toys are ideal for giving the finishing touch to your model railways. You must have railwaymen to deal with your trains, and passengers to travel in them; car attendants to look after the passengers, and engineers for the maintenance of the railway and its equipment. You want farmyard animals for lineside fields, and you should have at least one of the famous "Hall's Distemper" advertisements alongside your line.

Then there are the miniature train sets, rail car and various other types of motor vehicle. You can have hours of fun running these on the table or on the floor, arranging road and rail transport services from one point to another.

These splendid toys can all be purchased separately at the prices shown, or they can be obtained in complete sets. Ask your dealer to show you the complete range of Meccano Dinky Toys.

Meccano Dinky Toys No. 1

STATION STAFF

No. 1a	Station Master	each 3d.
No. 1b	Guard	,, 3d.
No. 1c	Ticket Collector	,, 3d.
No. 1d	Driver	,, 3d.
No. 1e	Porter with bags	,, 3d.
No. 1f	Porter	,, 3d.

Price of complete set 1/6

Meccano Dinky Toys No. 4

ENGINEERING STAFF

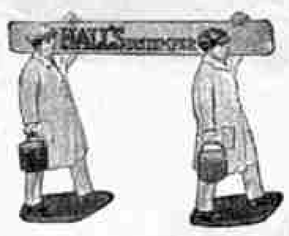
No. 4a	Electrician	each 3d.
No. 4b	Fitters	,, 3d.
No. 4c	Storekeeper	,, 3d.
No. 4d	Greaser	,, 3d.
No. 4e	Engine Room Attendant ...	,, 3d.

Price of complete set 1/6

STATION OR FIELD HOARDING

This is a realistic accessory, suitable for model station platforms, or for fields adjacent to the railway track.

Price 6d.



Meccano Dinky Toys No. 13

HALL'S DISTEMPER ADVERTISEMENT

This miniature of a well-known lineside advertisement is intended to be placed in the fields adjoining a model railway track. Price 9d.

Meccano Dinky Toys No. 6

SHEPHERD SET

No. 6a	Shepherd ...	each 3d.
No. 6b	Dog	,, 2d.
No. 2d	Sheep	,, 2d.

Price of complete set 1/–

Meccano Dinky Toys No. 5

TRAIN AND HOTEL STAFF

No. 5a	Pullman Car Conductor ...	each 3d.
No. 5b	Pullman Car Waiters	,, 3d.
No. 5c	Hotel Porters	,, 3d.

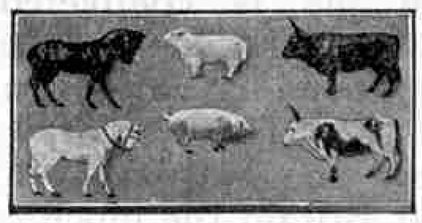
Price of complete set 1/3

Meccano Dinky Toys No. 3

PASSENGERS

No. 3a	Woman and Child	each 3d.
No. 3b	Business Man	,, 3d.
No. 3c	Male Hiker	,, 3d.
No. 3d	Female Hiker	,, 3d.
No. 3e	Newsboy	,, 3d.
No. 3f	Woman	,, 3d.

Price of complete set 1/6



Meccano Dinky Toys No. 2

FARMYARD ANIMALS

No. 2a	Horse ...	each 3½d.
No. 2b	Cow	,, 3½d.
No. 2c	Pig	,, 2d.
No. 2d	Sheep	,, 2d.

Price of complete set 1/6

New items are constantly being added to the series of Meccano Dinky Toys, to increase the fun and fascination.

Meccano Dinky Toys No. 17

PASSENGER TRAIN SET

No. 17a	Locomotive	each 9d.
No. 17b	Tender	,, 5d.
No. 20a	Coach	,, 7d.
No. 20b	Guard's Van	,, 7d.

Price of complete set 2/3

Meccano Dinky Toys No. 18

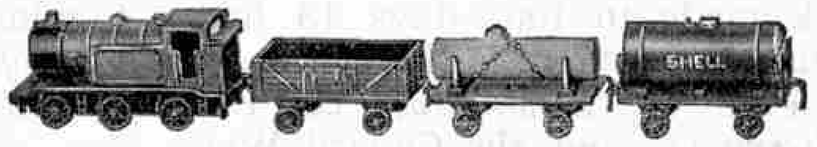
GOODS TRAIN SET

No. 21a	Tank Locomotive	each 9d.
No. 21b	Wagons	,, 4d.

Price of complete set 1/9

RAILWAY ACCESSORIES No. 7

Watchman's Hut, Brazier, Shovel and Poker. Price 1/3



Meccano Dinky Toys No. 19

MIXED GOODS TRAIN SET

No. 21a	Tank Locomotive	each 9d.
No. 21b	Wagon	,, 4d.
No. 21d	Petrol Tank Wagon	,, 6d.
No. 21e	Lumber Wagon	,, 5d.

Price of complete set 1/11

Meccano Dinky Toys No. 20

PASSENGER TRAIN SET

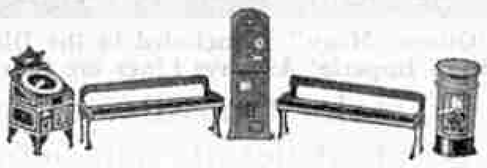
No. 21a	Tank Locomotive	each 9d.
No. 20a	Coaches	,, 7d.
No. 20b	Guard's Van	,, 7d.

Price of complete set 2/6

RAILWAY ACCESSORIES No. 2

Milk Cans and Truck.

Price per set 1/3

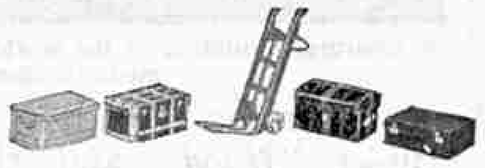


RAILWAY ACCESSORIES No. 3

Platform Machines, etc. Price 1/6

RAILWAY ACCESSORIES No. 4

This set comprises all the pieces that are contained in Railway Accessories Nos. 1, 2 and 3. Price 3/9



RAILWAY ACCESSORIES No. 1

Miniature Luggage and Truck. Price 1/–

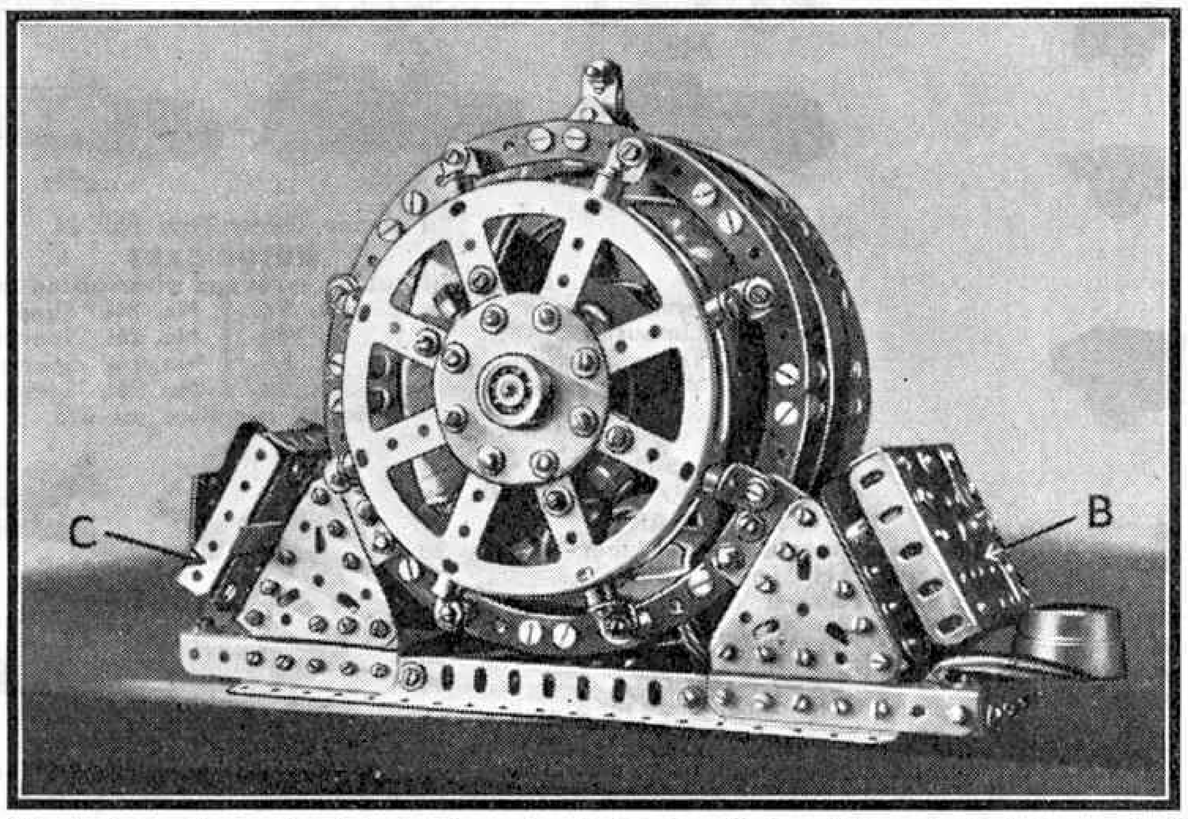
Manufactured by MECCANO LTD., Binns Road, LIVERPOOL 13

A Novel Home-made Electric Motor

Clever Work by an "M.M." Reader

THE electric motor illustrated on this page is noteworthy in various respects. It is realistic and attractive in appearance, novel in design, and thoroughly efficient in performance. The motor is the work of Mr. I. Rietti of Milan, and although it is not built entirely with Meccano, we feel sure that readers will be interested in the following details of its construction.

The field magnet and armature laminations are the most important parts of the motor, and it is to their neat and careful construction that the satisfactory running and power of the motor are largely due. For the field magnet laminations discs of thin soft iron sheet are used. These are exactly the same size as Meccano Circular Strips, and each has a 1½" radius hole in its centre and is also drilled with equidistant holes round its rim, the spacing of the holes coinciding with those of a Meccano Circular Strip. Several similar discs are clamped together to make a ¾" thickness, and the wide ring so formed is cut away leaving a band ½" wide all round, with the exception of two poles 3⅛" in width.



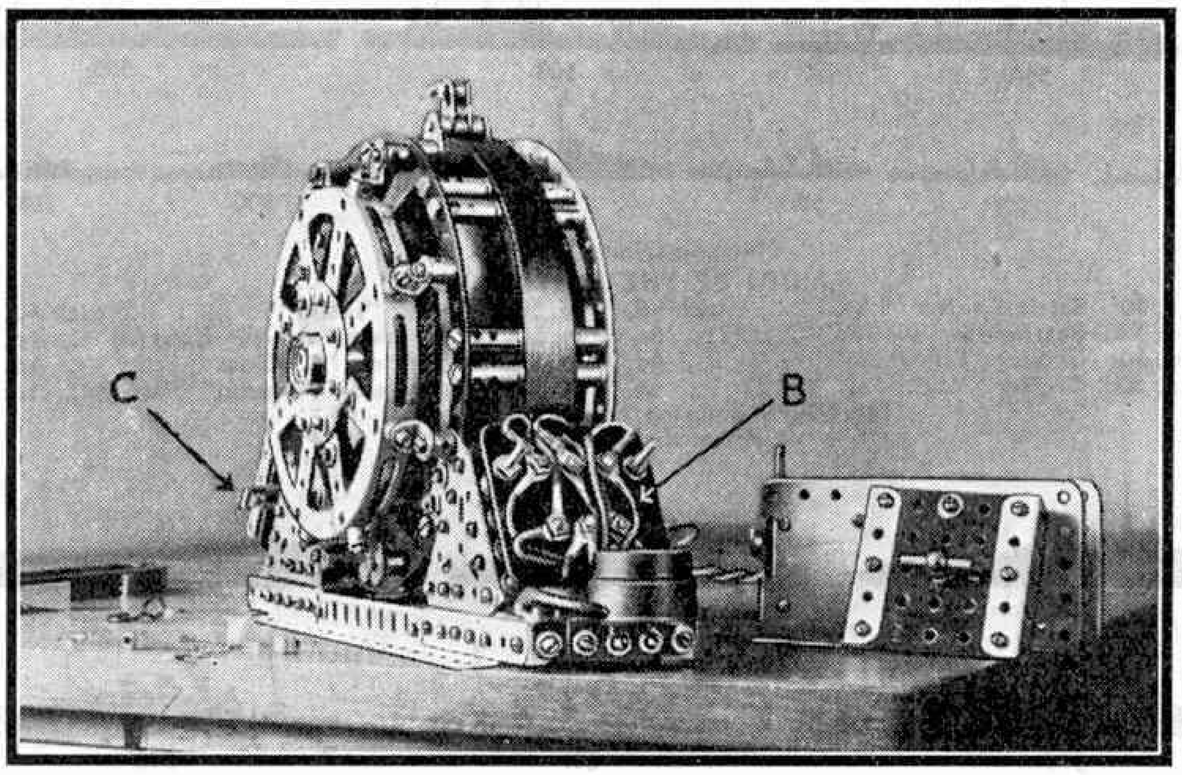
The ingeniously constructed electric motor that is described on this page. It is the work of Mr. I. Rietti, Milan.

The armature also is composed of a ¾" thickness of 1-15/32" radius soft iron discs, round the rims of which twelve ½" diameter holes are drilled, the centres of the holes being 9/16" from the outer edges of the discs. The holes are elongated by filing towards the centre of the disc, and they measure ⅝" in length and ⅜" in diameter at their inner ends. The thin piece of metal then left at the outer end of each elongated hole is also filed away to produce a 3/16" gap.

The armature shaft was made specially for the purpose, and was turned on a lathe, coned bearings being provided. The armature plates are clamped on to the shaft between a fixed Collar and a threaded plate, and are also keyed in position, the slots in the armature plates being arranged all in line. Brown paper, thoroughly impregnated with shellac, was superimposed between the soft iron laminations of both the armature and the field magnet.

The field magnet and the poles of the armature are wound with 35 S.W.G. double cotton-covered copper wire, which was first wound into two coils round a former of the same size as the poles of the field magnet. Each coil was then fixed carefully in place by bindings of wire.

The special commutator was made from a piece of ebonite rod and provided with copper segments.



Another view of the motor, showing the field laminations and the reversing switch. An old type Meccano Motor is also shown in order to give readers some idea of the size of Mr. Rietti's fine machine.

The field laminations are held together by means of Meccano Threaded Rods and Threaded Couplings, and Circular Strips are bolted on to the Threaded Couplings on each side of the field magnet by means of Pivot Bolts.

Several Angle Brackets are fastened at equal distances round the face of each Circular Strip, as is shown in the illustrations, and are held in place by ½" Bolts. The Angle Brackets are spaced from the Circular Strips by means of Threaded Bosses, and form supports for Hub Discs, which are spaced from them by means of Collars. The Hub Discs are arranged so that their centre holes are exactly in line with the centre of the armature tunnel. The clearance between the armature and the field magnet is only 1/32", and as the Hub Discs form the supports for the main bearings it was important that they should be accurately placed in position. Ball races are used for the main bearings, and they were made specially for this model. The bearings are very efficient, so that even when the motor is working at top speed there is very little vibration.

The brush holders consist of brass tubes of the required bore and length, inserted into blocks of ebonite, which are screwed to the spokes of one of the Hub Discs. The brass tubes are threaded at their outer ends, and each is fitted with a milled cap by means of which the pressure of the carbon brushes on the commutator can be varied.

The motor is series wound, that is the current passes first to one of the brushes, through the armature to the second brush, and then through the field coils.

The motor is wound to run off 110 volts A.C., but by means of an arrangement of resistances, C, which can be brought into circuit with the motor, it is possible to work it on a 220 volts supply. A reversing switch, B, also is fitted, and with this the motor can be started, stopped or reversed at will. The switch functions by altering the circuit connections of the armature and field magnet so that the direction of flow of the field current is opposite to that of the armature current.

The upper illustration shows the completed motor in working order and the lower illustration will give readers a good idea of the size of the model in comparison with that of an ordinary Meccano reversing Electric Motor.

Unfortunately Mr. Rietti has not been able to make an exact measurement of the power of the motor and we are unable to give any definite figures for the current consumption.

From the details given here readers will realise that much skilful work has been put into the model, but we think that by making certain alterations in the design and construction of the armature and its bearings, other model-builders will be able to build workable motors from standard Meccano parts. The bearings could be made with the bosses of two Bush Wheels provided with Grease Cups for lubrication purposes. The commutator, which perhaps is the most difficult part to make, could be formed from 6 B.A. Screws fitted with Insulating Bushes and secured to the face of a Bush Wheel, and there are other variations in design that no doubt will occur to readers.

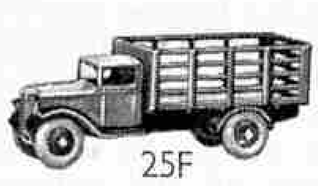
MECCANO

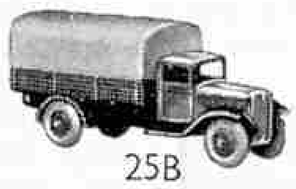
DINKY TOYS

Made of the finest materials

A fascinating collecting hobby

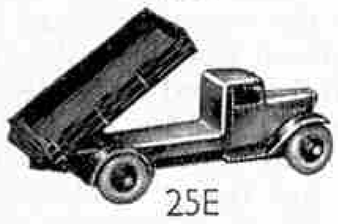
150 Varieties


25F


25B

25D

25C


25E

25A

Meccano Dinky Toys No. 25

COMMERCIAL MOTOR VEHICLES

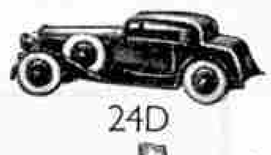
Fitted with rubber tyres and silver-plated radiators.

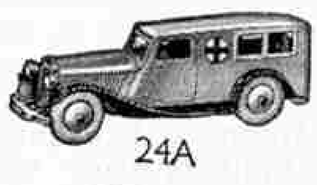
No. 25a	Wagon	each	9d.
No. 25b	Covered Van	,,	9d.
No. 25c	Flat Truck	,,	9d.
No. 25d	Petrol Tank Wagon ...	,,	9d.
No. 25e	Tipping Wagon	,,	9d.
No. 25f	Market Gardener's Van	,,	9d.

Price of complete set 4/6

24E

24G

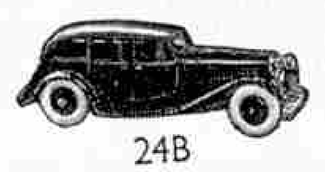

24D


24A

24F

24C

24H


24B

Meccano Dinky Toys No. 24

MOTOR CARS

Fitted with rubber tyres and silver-plated radiators.

No. 24a	Ambulance	each	9d.	No. 24e	Super Streamline Saloon	each	9d.
No. 24b	Limousine	,,	9d.	No. 24f	Sportsman's Coupé ...	,,	9d.
No. 24c	Town Sedan	,,	1/-	No. 24g	Sports Tourer (4 seater)	,,	1/-
No. 24d	Vogue Saloon	,,	9d.	No. 24h	Sports Tourer (2 seater)	,,	1/-

Price of complete set 6/6

Meccano Dinky Toys No. 60

AEROPLANES

No. 60a	Imperial Airways Liner	each	9d.
No. 60b	D.H. "Leopard Moth" ...	,,	6d.
No. 60c	Percival "Gull"	,,	6d.
No. 60d	Low Wing Monoplane ...	,,	6d.
No. 60e	General "Monospar" ...	,,	6d.
No. 60f	Cierva "Autogiro" ...	,,	6d.

Price of complete set 3/-

60E

60A

60C

60D

60F

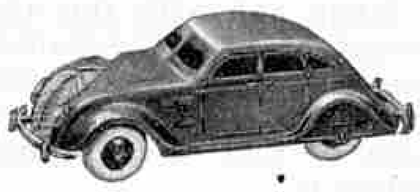
60B

Finished in Bright Colours

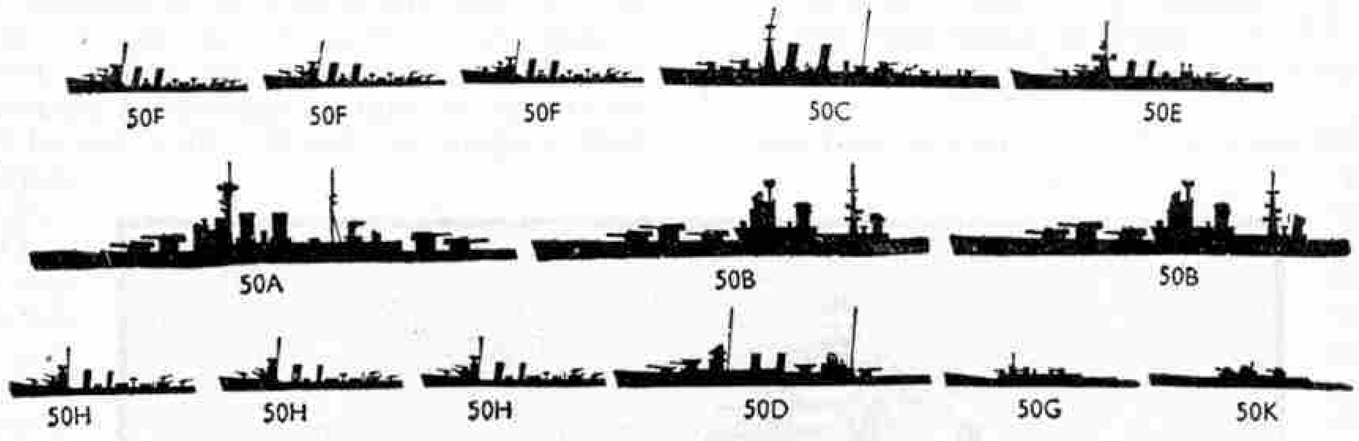
Realistic and Attractive Models

Meccano Dinky Toys No. 52 **CUNARD WHITE STAR LINER "QUEEN MARY"**
A scale model of the World's largest ocean liner. Price 1/- each

Meccano Dinky Toys No. 52a. Exactly as No. 52, but fitted with roller wheels. Price 1/- each



Meccano Dinky Toys No. 32
"AIRFLOW" SALOON
Assorted colours. Fitted with rubber tyres. Silver-plated radiator and bumpers.
Price 9d. each.
Ready shortly.


50F 50F 50F 50C 50E
50A 50B 50B
50H 50H 50H 50D 50G 50K

Meccano Dinky Toys No. 31
HOLLAND COACHCRAFT VAN
Assorted Colours
Price 6d. each.
Ready shortly.

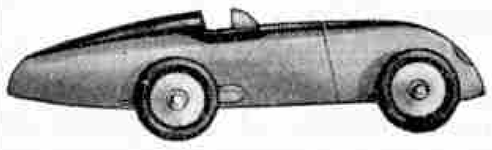
Meccano Dinky Toys No. 50

SHIPS OF THE BRITISH NAVY

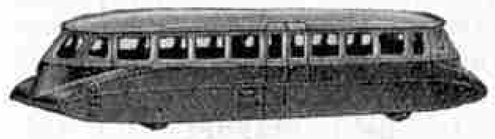
No. 50a	Battle Cruiser "Hood" ...	each	9d.	No. 50e	Cruiser "Delhi"	each	4d.
No. 50b	Battleships, "Nelson" Class (2)	,,	6d.	No. 50f	Destroyers, "Broke" Class (3)	,,	1d.
No. 50c	Cruiser "Effingham" ...	,,	4d.	No. 50g	Submarine, "K" Class ...	,,	1d.
No. 50d	Cruiser "York"	,,	4d.	No. 50h	Destroyers, "Amazon" Class (3)	,,	1d.

No. 50k Submarine, "X" Class ... each 1d.

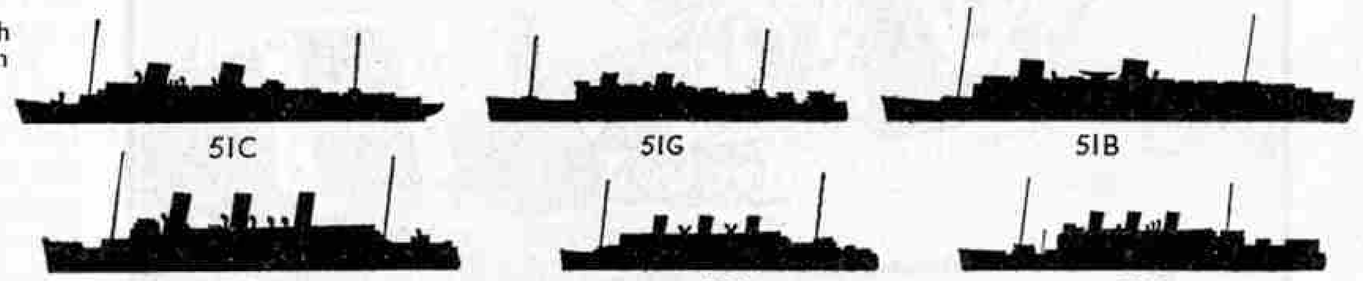
Price of complete set 3/6

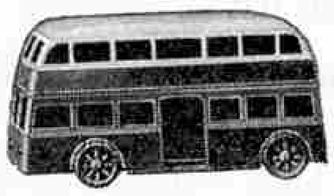


Meccano Dinky Toys No. 23
RACING CAR
Assorted Colours. Fitted with rubber tyres. Price 6d. each



Meccano Dinky Toys No. 26
G.W.R. RAIL CAR
Assorted Colours. Price 6d. each


51C 51G 51B
51D 51F 51E



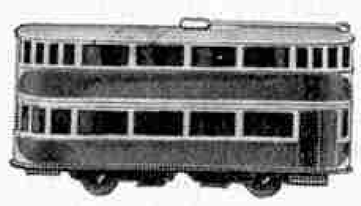
Meccano Dinky Toys No. 29
MOTOR BUS
Assorted Colours. Price 6d. each

Meccano Dinky Toys No. 51

FAMOUS LINERS

No. 51b	"Europa"	... each	9d.	No. 51e	"Strathaird" ...	... each	6d.
No. 51c	"Rex"	... ,,	9d.	No. 51f	"Queen of Bermuda"	... ,,	6d.
No. 51d	"Empress of Britain"	... ,,	8d.	No. 51g	"Britannic"	... ,,	6d.

Price of complete set 3/6



Meccano Dinky Toys No. 27
TRAM CAR
Assorted Colours. Price 6d. each

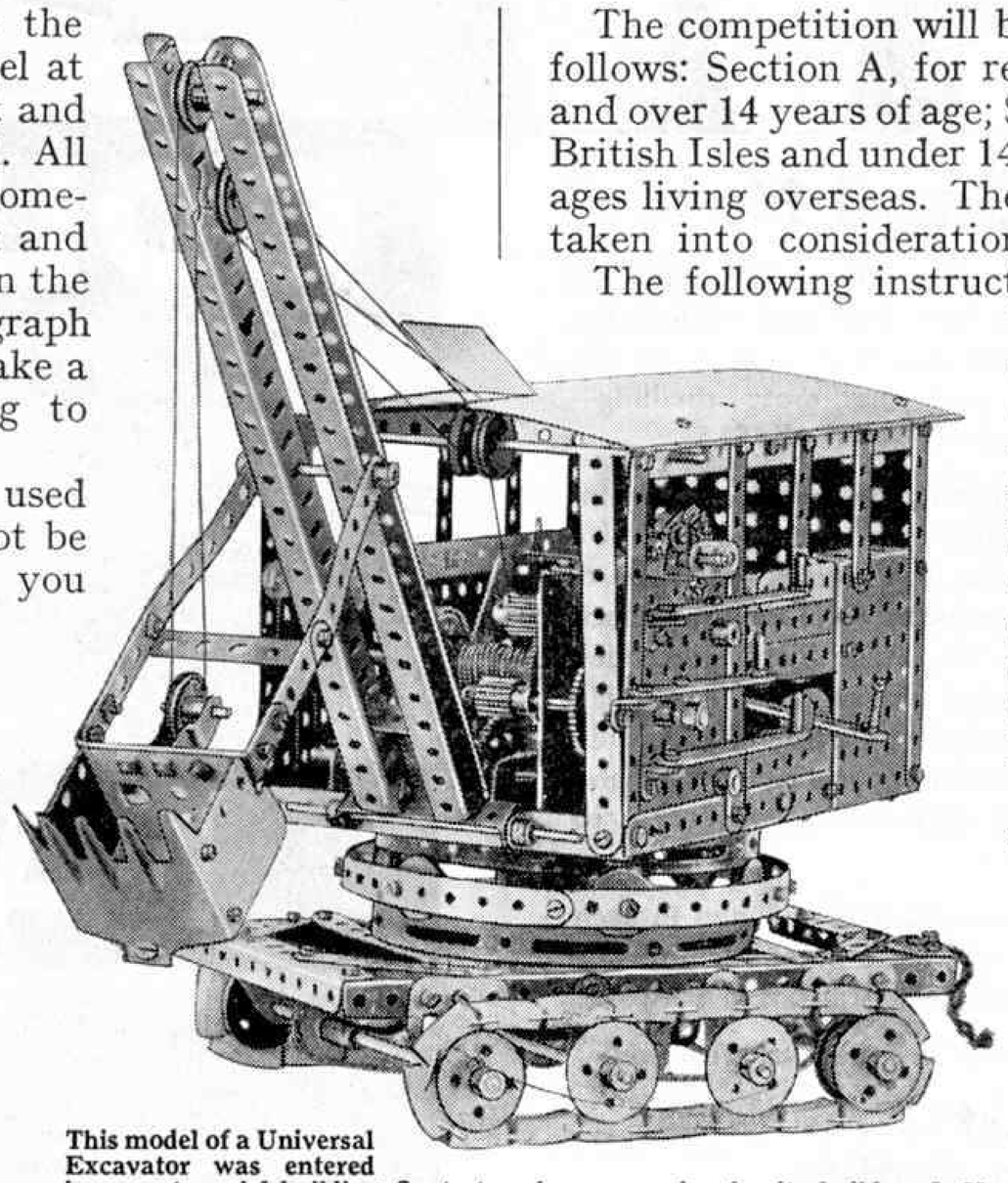
Manufactured by MECCANO LTD., Binns Road, LIVERPOOL 13

More Prizes for Model-Builders

"Christmas" General Model-building Competition

In this Competition we offer the splendid prizes listed in the panel at the foot of this page for the best and most original models submitted. All you have to do is to think of something new and then set to work and build it neatly in Meccano. When the model is completed, take a photograph of it, or if this is not possible, make a neat sketch, and send it along to Meccano Limited.

Any number of parts may be used in building the model, but do not be disheartened simply because you possess only a small Outfit. We are constantly reminding readers that a simple, well-built model stands a far greater chance of success than a badly designed and poorly constructed model, no matter how large and elaborate it may be. There are no entry forms to fill in and no fees to pay. All models submitted must be your own handiwork both in design and construction, but the photographs or drawings need not be your own work. It should be clearly understood that actual models must not be submitted for consideration.



This model of a Universal Excavator was entered in a past model-building Contest and won a prize for its builder, J. H. Mumby, Lincoln.

The competition will be divided into three Sections as follows: Section A, for readers living in the British Isles and over 14 years of age; Section B for readers living in the British Isles and under 14; Section C for competitors of all ages living overseas. The ages of all competitors will be taken into consideration when judging.

The following instructions must be followed closely. Your age, name and address, together with the letter (A, B or C) indicating the Section for which the entry is eligible, and the name of the competition must be written clearly on the back of each photograph or drawing submitted. Address the envelope to "Christmas" Model-building Contest, Meccano Limited, Binns Road, Liverpool 13.

The closing date for Sections A and B will be 31st January, 1935, but Section C will remain open for entries until 30th March, 1935. Any entries received after these dates will be disqualified.

Photographs or drawings of prize-winning models become the property of Meccano Ltd., but unsuccessful entries will be returned if a stamped addressed envelope is enclosed.

"Year's Best Prize Model" Voting Contest

In this Contest each competitor is asked to name on a postcard: (A) The prize-winning model he considers the most interesting and best constructed described in the "*M.M.*" during 1934; (B) The six models that he believes will prove the most popular, as decided by the massed votes of the competitors in this Contest.

Only models that have been described or illustrated on the "Model-building Contests Results" and "Model-building Competition" pages in any of the issues of the "*M.M.*" during 1934, including those illustrated in this issue, are to be taken into consideration in this Contest. Each model referred to must be identified by giving the page and date of the issue in which the description or illustration appeared, the name of the model, and that of its builder.

Entries must be written on postcards only. The competitor's name and address must be written on the card, which should be addressed to "Year's Best Prize Model" Voting Contest, Meccano Ltd., Binns Road, Liverpool 13. One entry only will be accepted from each competitor; any competitor who sends more than one entry will be disqualified.

There will be one Section only, and competitors of any age may compete. The closing date is 28th February, 1935. The list of principal prizes to be awarded to the competitors whose lists most accurately forecast the final results as decided by the massed "A" votes of all competitors appears in the panel on this page.

In addition to the prizes shown in the panel, the builders of the six models chosen as the best will each receive Meccano goods, value 5/–.

In the unlikely event of two or more competitors placing the six best models in the correct order, First Prize will be awarded to the competitor whose entry is the neatest. The judges' decision on this point is final.

Before sending in their lists of models competitors must take care to see that each model is clearly identified. In cases where the builder's name does not appear in the article or in the caption to the "*M.M.*" illustration or in the description, it will usually be found by reference to the prize lists.

Prizes Offered in these Competitions

Christmas Model-building Contest

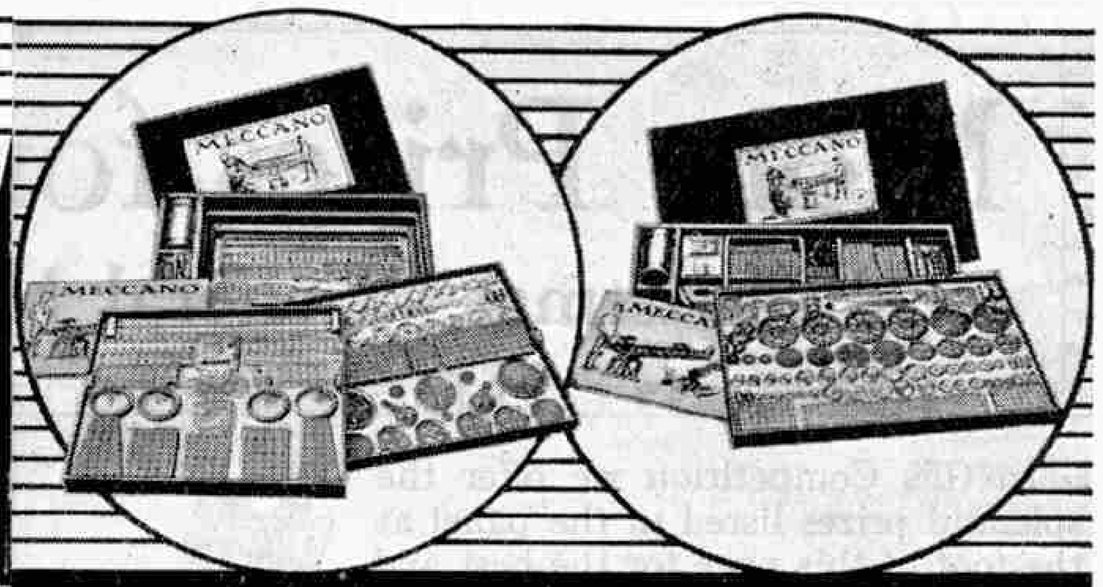
The following range of prizes will be awarded in each Section:

First Prize: Meccano or Hornby Goods value £3-3s.
Second Prize: Meccano or Hornby Goods value £2-2s.
Third Prize: Meccano or Hornby Goods value £1-1s.
Fourth Prize: Meccano or Hornby Goods value 15/–.
Five Prizes of Meccano or Hornby Goods value 10/6.
Five Prizes of Meccano or Hornby Goods value 5/–.

"Year's Best Prize Model" Voting Contest

First Prize: Meccano or Hornby Goods value £2-2s.
Second Prize: Meccano or Hornby Goods value £1-1s.
Third Prize: Meccano or Hornby Goods value 10/6.
Fourth Prize: Meccano or Hornby Goods value 5/–.

NEW



Boys! Here's Good News!

This will be an outstanding year in the history of Meccano. Of all the wonderful improvements that have ever been made in the world-famous Meccano System, those that have been made this year are the most stupendous and the most thrilling—NEW COLOURS, NEW PARTS and NEW MANUALS.

The 1934 New Meccano is finished in a striking colour combination of Blue and Gold, and the models constructed with it are of a brilliance never before attainable. In addition, the scope of the Outfits is greatly increased by the inclusion of new and specially designed parts. Among these are Strip Plates, intended primarily for filling in purposes; Hinged Flat Plates that simplify completely the problem of roof structures; Flexible Plates made of fibre board that can be bent to almost any desired shape; and a Road Wheel and Steering Wheel that will be invaluable to builders of Motor Car models.

A magnificent new Manual of Instructions is included in each New Meccano Outfit, giving details of a large number of models that can be built, together with beautiful illustrations in half-tone.

See the New Meccano at your dealer's. Take Dad with you!

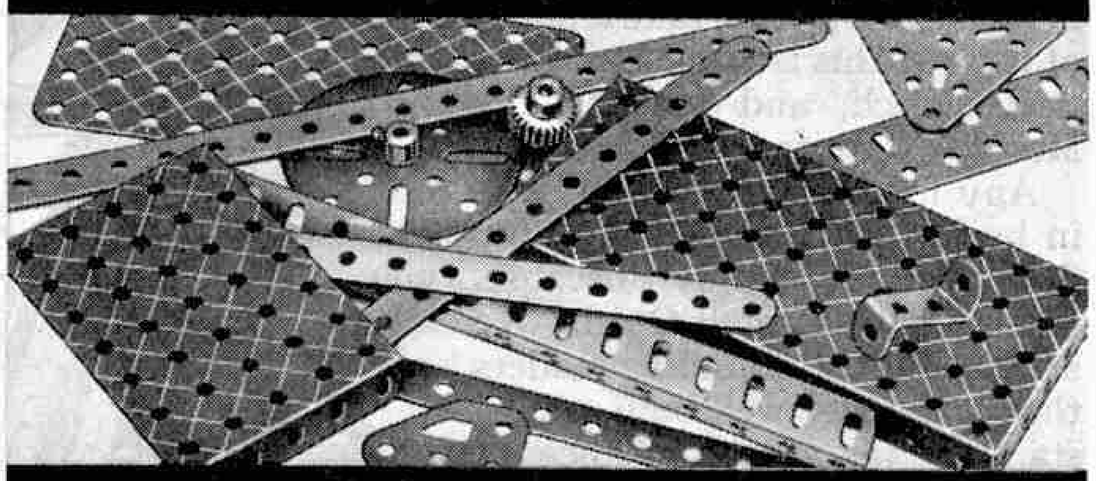
Prices of New Meccano Outfits

A	Outfit	... each	5/-
B	„	... „	7/6
C	„	... „	10/-
D	„	... „	15/-
E	„	... „	20/-
F	„	... „	30/-
G	„	... „	55/-
H	„ (Carton)	... „	72/6
Hw	„ (Cabinet) ...	... „	97/6
K	„ (Carton)	... „	132/6
Kw	„ (Cabinet) ...	... „	157/6
L	„ („) ...	... „	410/-

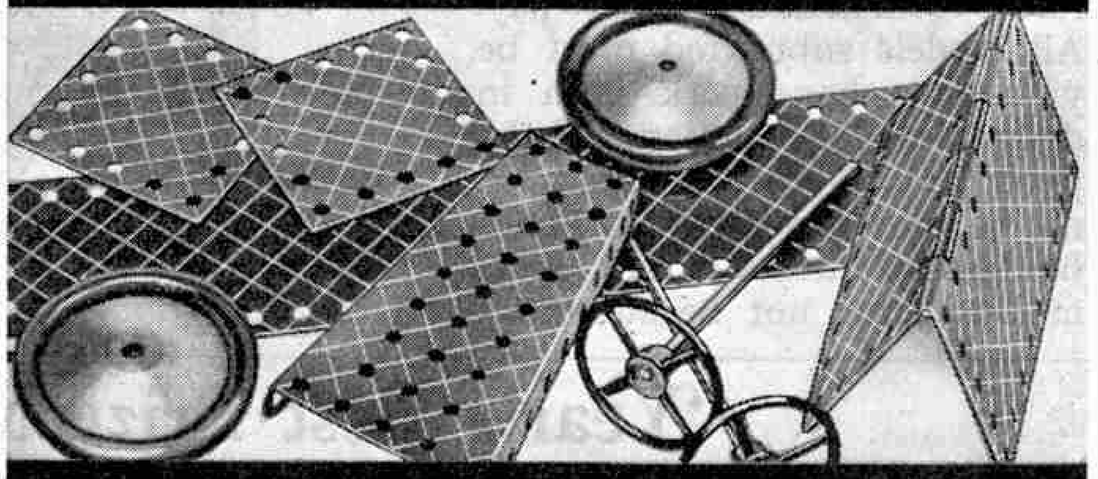
There's a wonderful new Meccano Book in colours that tells you all about the New Meccano and other Meccano Products. Details of this are given on page iii of cover.

Meccano Limited Binns Road Liverpool 13

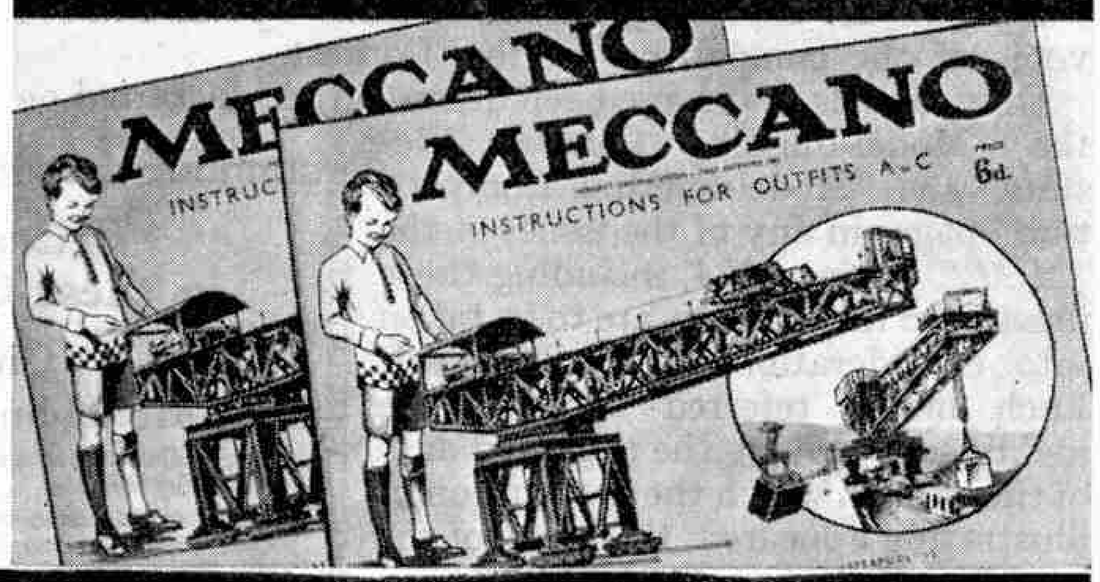
COLOURS



PARTS



MANUALS



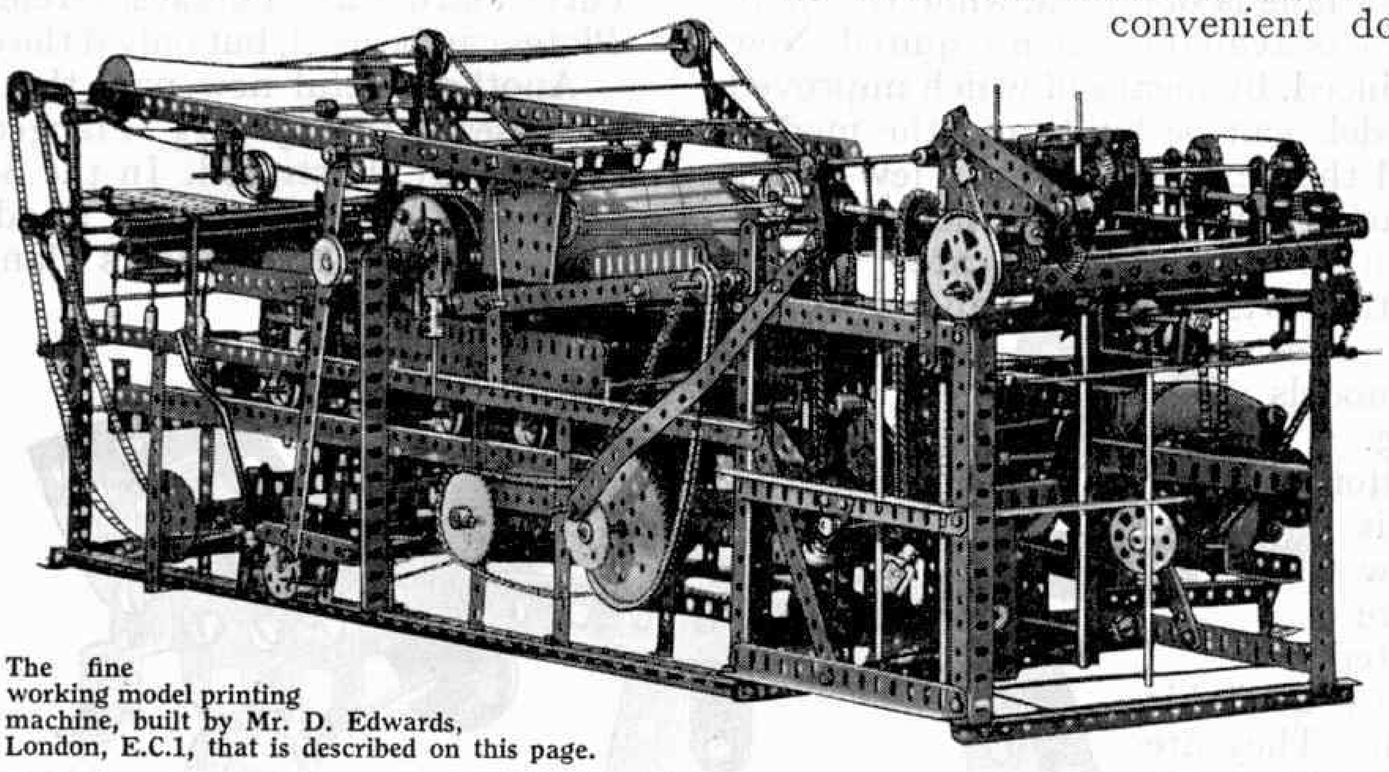
If you wish you can still obtain Meccano Outfits and Parts with the Red-Green finish.

The new MECCANO

A Meccano Printing Machine

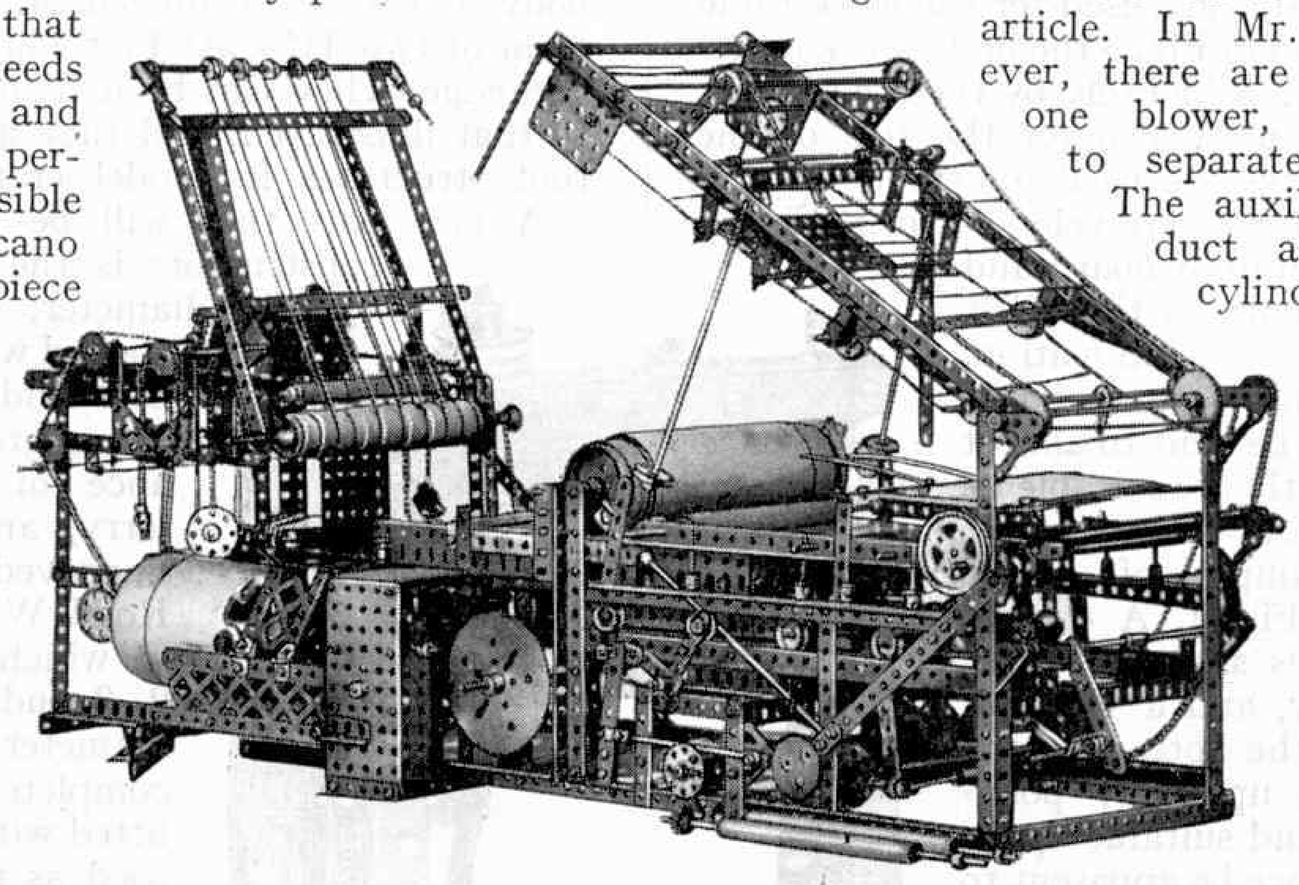
London Reader's Fine Model

IN the July 1932 issue of the "*M.M.*" we illustrated and described a Meccano printing machine designed by our model-builders. Since that article appeared we have received details of other models of the same kind built by "*M.M.*" readers, and on this page we illustrate one of the best that has yet come to our notice. The builder of this fine model is Mr. D. Edwards, London, E.C.1, who informs us that he set out to construct a model based on the well-known "Wharfedale" type printing machine. His model produces all the essential movements of a machine of this kind, and, with the exception of the impression cylinder, inking rollers and one or two other special pieces, he has succeeded in building the model from standard Meccano parts. The sheet of paper to be printed is fed automatically to the impression roller and is then passed over the face of the type. After being printed it is ejected on to the delivery pile.



The fine working model printing machine, built by Mr. D. Edwards, London, E.C.1, that is described on this page.

Owing to the fact that the impression roller needs to be perfectly smooth and flat, and without any perforations, it was impossible to make it from any Meccano part, and therefore a piece of brass tubing about 6 in. in length and $2\frac{3}{8}$ in. in diameter was used for the purpose. The end bearings for the roller were formed by soldering Meccano Strips across each end. The model has a sheet zinc ink-slab, and the same material is used for the type bed. The inking rollers are made from short pieces of rubber tubing.



Another view of Mr. Edwards' machine, showing the paper delivery mechanism opened up to facilitate setting of the type.

The mechanism is driven by an Electric Motor, the drive from which is transmitted via a Worm, 57-teeth Gear, $\frac{1}{2}$ in. Pinion and $3\frac{1}{2}$ in. Gear to twin lengths of Sprocket Chain, one on each side of the machine. These drive the main operating crank, which has a throw of 4 in. The bed itself has a travel of 8 in. and the drive is imparted to it by means of travel gears and racks exactly as in an actual "Wharfedale" machine. A rack on the upper side of the bed drives the impression cylinder through a $2\frac{1}{2}$" Gear and is fitted with a free-wheel ratchet motion. Two Contrates situated inside the cylinder form a convenient dog-clutch, and enable the operator to throw the cylinder out of gear at will.

The grippers in the cylinder are Ratchet Pawls, and are operated by a stationary cam as the cylinder revolves. A Sprocket Chain drive from the main crankshaft operates the forward rollers, and the sheet of paper to be printed is carried into the grippers on elastic bands. After travelling round the cylinder the sheet is dropped on to the sheet delivery mechanism, and finally is thrown out at the other end of the machine.

The construction of the automatic feeder is similar to that adopted in connection with the Meccano model Printing Machine referred to at the beginning of this article. In Mr. Edwards' model, however, there are two suction bands and one blower, the latter being used to separate the sheets of paper. The auxiliaries include an inking duct and an adjustable feed-cylinder braking mechanism, which is automatically applied when the impression cylinder is out of gear; and a complete system of inking rollers. The model is 33 in. in length and 10 in. in width.

Ordinary printers' type, linotype or line blocks may be used in the machine, and to facilitate setting the type the feed board and delivery rollers are designed to swing upward without disturbing the synchronisation of the mechanism. The machine is shown in the lower illustration with the delivery assembly opened up.

We hope that this short description of Mr. Edwards' fine model will stimulate other readers to try their skill in this kind of work.

The Blue-Gold Meccano

New Colours - New Parts - Better Models

THIS year Meccano makes its appearance in a striking colour combination of blue and gold, and models built with it are more attractive than ever before. Strips and Girders are coloured gold, and the plates are blue with gold cross lines on one side only. Thus by using one side of the Plates a plain blue is obtained, while the more attractive gilt-lined side is available when required. New parts have been introduced, by means of which improved and more realistic models can be built, and the models illustrated on this and the next page show a few of the uses of the new parts. Simple models have been purposely chosen to indicate clearly and it will be obtainable the purpose served by the parts, and it will be understood that the effects obtainable in large and elaborate models are still more striking.

An outstanding addition to the Meccano range is provided by the new Strip Plates. These are metal plates perforated on the edges only, and are available in five different lengths. They are intended chiefly for "filling in" purposes, and structures that previously consisted of little more than a framework can now be completed with the new parts to give a solid appearance. The models shown in Figs. 2, 3, and 4 show on a small scale the application of Strip Plates for these purposes.

In Fig. 2 two Strip Plates are used for the work-table of the Sewing Machine, and in Fig. 3 the body-work of the Motor Lorry is improved considerably by the use of these Plates. A Strip Plate is used also for the top of the driver's cab. Similar Plates are used for three sides of the box body of the Delivery Tricycle shown in Fig. 4.

Flexible Plates made of fibre board and finished in the same colours as the other Plates form another important innovation. These Flexible Plates, which are available in five different sizes, can be bent to almost any shape, and consequently are suitable for use wherever curved and bent plates are required. Examples of their uses are shown in Fig. 1. A $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate is shaped to form the horse's body, and a $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Plate is curved to form the bottom of the trap. These Plates open up many possibilities for new models, and suitable applications for them will at once be apparent to the enthusiastic model-builder. In the new Manuals of Instruction they are used for coupé bodies for motor cars, for Meccano doll's house furniture, for many amusing animals, for a model clock, for curved roofs, and also for filling-in purposes on curved structures, etc. As the Flexible Plates have not the strength of the Strip Plates, they should not be used for filling-in where they are called upon to withstand heavy stresses. In some cases they can be used quite well instead of Strip Plates if sufficient of the latter are not available, but it is advisable to reinforce them with Strips along the edges. If a curved structure of greater strength is required, the Strip Plates can be used, but only if the curves are of large radius.

Another useful new part that is adaptable for many purposes is the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate. Two of its uses are illustrated. In the Sewing Machine model it is employed as a treadle, having a $2\frac{1}{2}''$ Strip bolted to one of its Flanges and a Flat Trunnion forming an extension in the front. When used in conjunction with a Sector Plate forming a motor bonnet, the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate forms the radiator, as shown in Fig. 3.

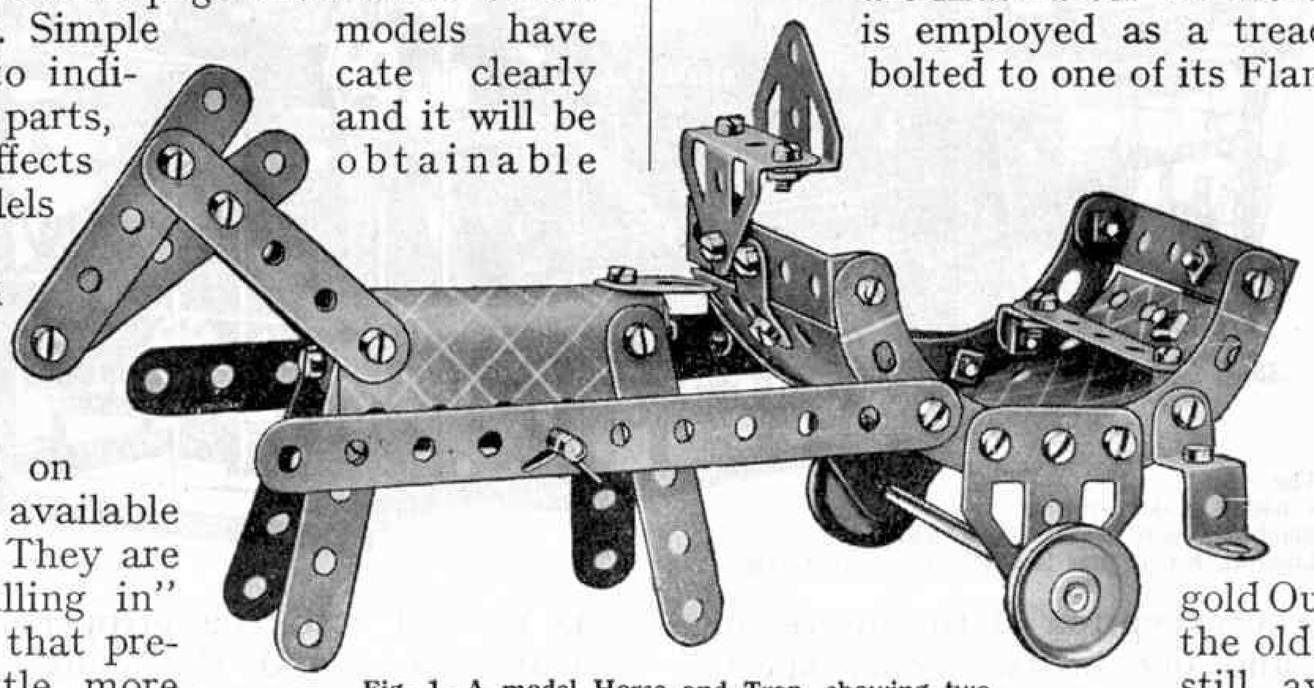


Fig. 1. A model Horse and Trap, showing two uses for the new Flexible Plates.

It should be noted that the Sector Plates supplied in the blue-gold Outfits are $4\frac{1}{2}''$ in length, but the old style Plates, 4" long, are still available. The new style, which has been found to be more adaptable, is shown in Figs. 2 and 3.

In the model illustrated in Fig. 4 another new part, the Hinged Flat Plate, is used to form one side of the box body and also the hinged lid. These Plates are in the form of two $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates hinged together along one edge. They can be used for doors and similar uses to that illustrated, and they are particularly useful for roof structures in model cranes, pit-head gears, etc.

A new part that will be welcomed by motor car constructors is the Steering Wheel. This is $1\frac{3}{4}''$ in diameter, and represents a four-spoked wheel complete with centre boss and Set Screw. The Steering Wheel greatly enhances the appearance of a model motor car or lorry, and such models are also improved by the use of the new Road Wheels, the general design of which can be seen from Figs. 2, 3 and 4. The parts are $2\frac{1}{2}''$ in diameter and represent disc wheels complete with tyres. They are fitted with centre boss and may be used as road wheels or flywheels, etc.

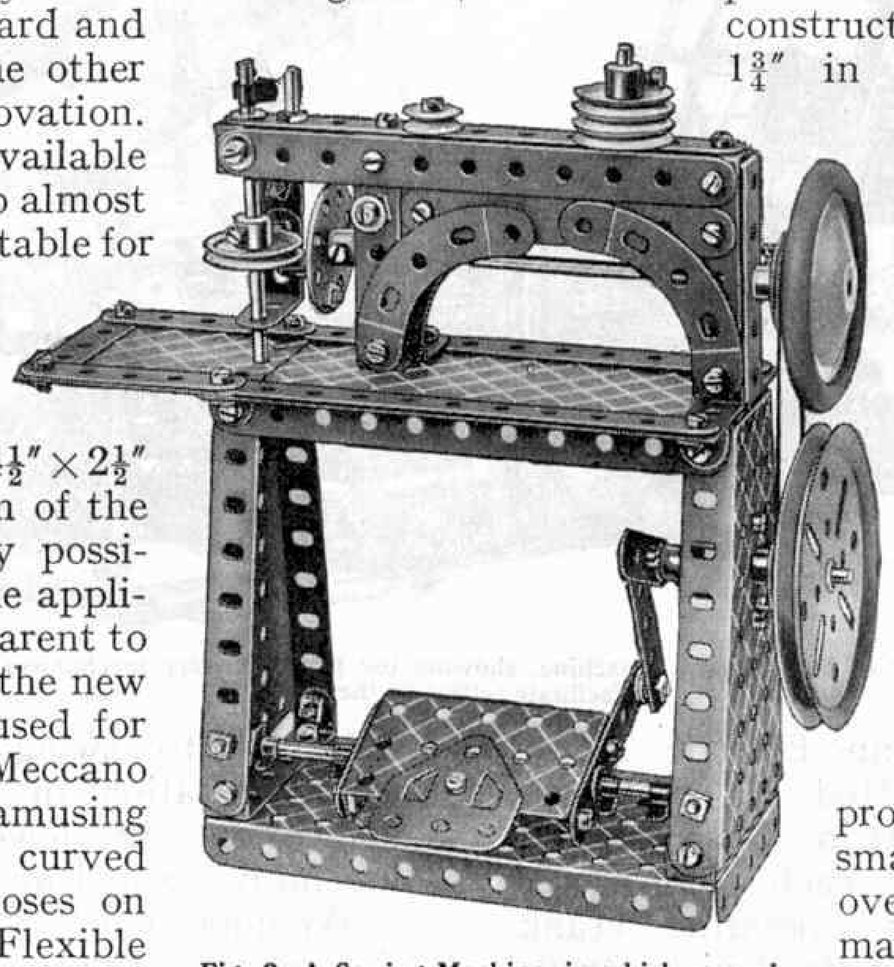


Fig. 2. A Sewing Machine, in which several of the new parts are used.

A method of obtaining a satisfactory belt drive has previously provided a problem for the builders of small models, but the new Driving Band overcomes this difficulty. The Band is made of square section rubber and is capable of transmitting quite a powerful

drive. Owing to its stretch it can be used between Pulley Wheels placed various distances apart. For instance, if used on 1″ Pulleys, it drives equally well between Pulleys spaced 1½″ between centres, or Pulleys spaced about 2½″ between centres. The Driving Band can be used also in cases where a light spring or elastic is required.

Two-Wheeled Trap

The construction of the simple model shown in Fig. 1 is well shown in the illustration. The trap is made from 2½″ Curved Strips spaced apart by 2½″ × ½″ Double Angle Strips and with a 4½″ × 2½″ Flexible Plate curved to form the bottom. A Flat Trunnion is bolted to each side, and these carry the Axle Rod fitted with two 1″ Pulleys. Steps are made from ½″ Reversed Angle Brackets attached to Angle Brackets, and a seat for the driver is formed from two Trunnions. For the shafts, 5½″ Strips are used, and the horse is held in these by means of an Axle Rod and Spring Clips.

The body of the animal is formed from a 2½″ × 2½″ Flexible Plate fitted with 2½″ Strips for legs and further 2½″ Strips for the neck. The Strips are bolted to Angle Brackets secured inside the bent Flexible Plate. A head formed from 2½″ Strips and a tail represented by a Flat Bracket complete the animal.

Parts required for Two-Wheeled Trap: 2 of No. 2; 9 of No. 5; 3 of No. 10; 8 of No. 12; 2 of No. 16; 2 of No. 22; 4 of No. 35; 35 of No. 37; 1 of No. 37a; 2 of No. 48a; 4 of No. 90a; 1 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 190; 1 of No. 191.

Sewing Machine

By operating the treadle of the model sewing machine shown in Fig. 2, the "needle" is made to move up and down. Two Sector Plates are bolted to 2½″ × ½″ Double Angle Strips that are secured to the base Plate. The upper ends of the Sector Plates are connected by 5½″ Strips to which Angle Brackets are secured. The Brackets carry further 5½″ Strips extended by means of 2½″ Strips, and also a 5½″ × 2½″ Strip Plate and a 2½″ × 2½″ Flexible Plate. In this case a Flexible Plate can be used in Place of a Strip Plate, since it is not called upon to withstand stresses. Moreover, Strip Plates of this size are not contained in the D Outfit with which the model can be built.

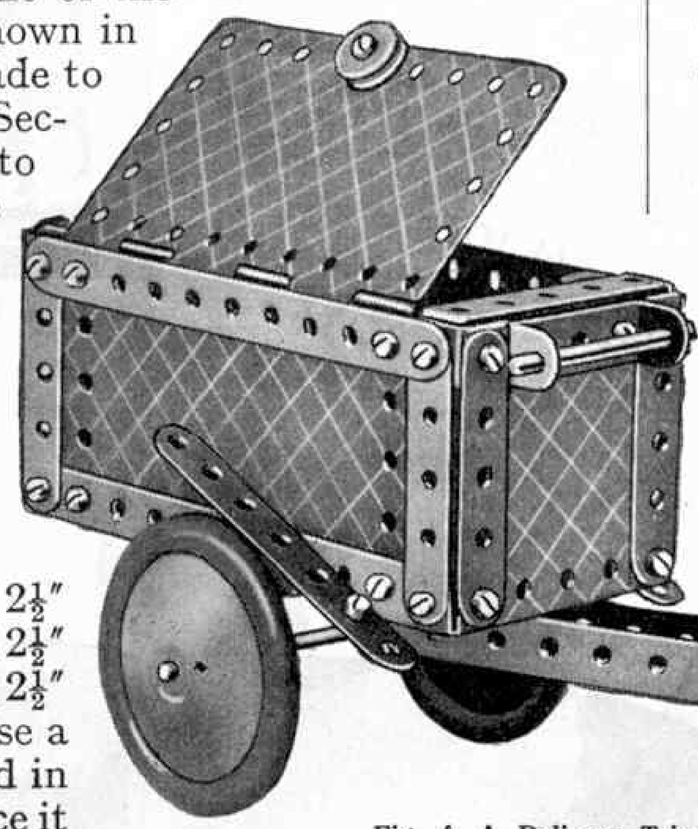


Fig. 4. A Delivery Tricycle in which the Hinged Flat Plate is used to advantage.

The body of the machine proper is made from 5½″ Strips and 2½″ × ½″ Double Angle Strips, and 2½″ Curved Strips are used to improve its appearance. At one end the body is secured to the 2½″ Strip bolted across one Sector Plate and at the other end by a 1″ × 1″ Angle Bracket.

The treadle is free to pivot on an Axle Rod mounted longitudinally on the base Plate and is pivotally connected, by a 2½″ Strip, to a Crank on a Rod journalled in a Double Bent Strip and one of the Sector Plates. The outer end of the Rod carries a 1″ Pulley and a 3″ Pulley, the former being connected by a Driving Band to a 1″ Pulley on the Rod journalled in the machine body. The Bush Wheel on this Rod carries an Angle Bracket that strikes the underside of a 1″ Pulley on a Rod representing the needle holder. As the Bush Wheel rotates, the Pulley is raised until the Angle Bracket on the Bush Wheel releases it; it then drops and is raised again the next time the Bracket comes round.

Parts required for Sewing Machine: 7 of No. 2; 2 of No. 3; 6 of No. 5; 1 of No. 6a; 3 of No. 10; 1 of No. 11; 10 of No. 12; 2 of No. 12a; 2 of No. 15; 1 of No. 16; 1 of No. 17; 1 of No. 18a; 1 of No. 19b; 4 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 24; 5 of No. 35; 50 of No. 37; 8 of No. 37a; 8 of No. 38; 1 of No. 45; 7 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 1 of No. 62; 4 of No. 90a; 3 of No. 111c; 1 of No. 115; 1 of No. 125; 1 of No. 126a; 1 of No. 176; 1 of No. 186; 1 of No. 187; 1 of No. 190; 1 of No. 195.

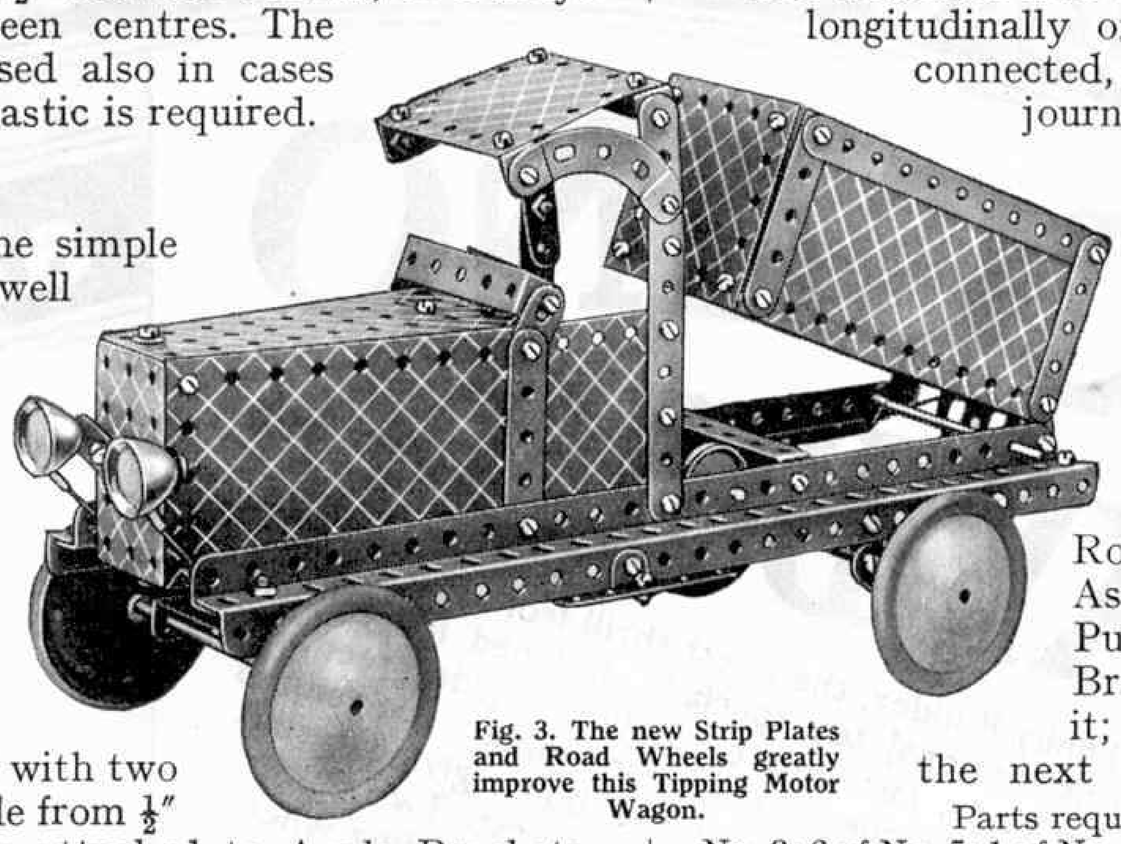


Fig. 3. The new Strip Plates and Road Wheels greatly improve this Tipping Motor Wagon.

NEW MECCANO PARTS

No.			No.		
51	Flanged Plates	2½″ × 1½″	191	Flexible Plates	4½″ × 2½″
54a	Sector ,,	4½″ long	192	,, ,,	5½″ × 2½″
185	Steering Wheels	1¾″ diam.	193	Strip Plates	2½″ × 2½″
186	Driving Bands		194	,, ,,	3½″ × 2½″
187	Road Wheels	2½″ diam.	195	,, ,,	5½″ × 2½″
188	Flexible Plates	2½″ × 1½″	196	,, ,,	9½″ × 2½″
189	,, ,,	5½″ × 1½″	197	,, ,,	12½″ × 2½″
190	,, ,,	2½″ × 2½″	198	Hinged Flat Plates	4½″ × 2½″

Tipping Motor Lorry

The chassis of the wagon is made from two side Girders, each formed from two 12½″ Angle Girders. A Sector Plate is bolted to 3½″ Strips between the Girders and carries two 4½″ × 2½″ Flexible Plates forming the sides of the bonnet. A 2½″ × 1½″ Flanged Plate at the front of the lower Sector Plate supports a second Sector Plate, which is held at the rear by 2½″ Strips. A windscreen is represented by a 2½″ × ½″ Double Angle Strip.

The cab is formed from vertical Strips carrying 2½″ Curved Strips to support the roof, and is filled in at the sides by 2½″ × 2½″ Flexible Plates.

The body of the lorry is built up on a 5½″ × 2½″ Flanged Plate and pivots about ⅜″ Bolts that are passed through the rear of the lorry Girders and through Flat Brackets that are bolted to the Flanged Plate. The tipping movement is operated by a length of cord that is wound on to a Crank Handle situated immediately behind the cab. The cord is tied to a Flat Trunnion bolted at the back of the wagon.

Readers should note in this model the use of the Lighting Set. This interesting addition is dealt with in detail on page 1013.

Parts required for Tipping Motor Lorry: 2 of No. 2; 2 of No. 3; 12 of No. 5; 4 of No. 8; 8 of No. 10; 2 of No. 12; 1 of No. 15; 1 of No. 15a; 1 of No. 15b; 1 of No. 16; 1 of No. 19s; 3 of No. 22; 1 of No. 24; 5 of No. 35; 65 of No. 37; 6 of No. 37a; 7 of No. 38; 1 of No. 40; 1 of No. 45; 8 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 4 of No. 90a; 2 of No. 111c; 1 of No. 125; 2 of No. 126a; 1 of No. 176; 4 of No. 187; 4 of No. 190; 2 of No. 191; 2 of No. 192; 1 Lighting Set.

(Continued on page 1026)

A new and fascinating building hobby for boys and girls

MECCANO DINKY BUILDER

The new Meccano Dinky Builder, the latest thrill from Meccanoland, is a fascinating constructional toy specially designed for younger boys and girls. The parts, tastefully enamelled in jade green and salmon pink, are fitted together in the most simple and ingenious manner without the use of any nuts and bolts, giving results that are attractive and of exceptional interest. Two Outfits are available: No. 1 for general construction including wheel toys, and No. 2 for making groups of miniature furniture. Your dealer will be pleased to show you these new Meccano Dinky Builder Outfits.

No. 1 DINKY BUILDER OUTFIT

This Outfit contains a good selection of parts with which a large number of models can be made. It includes two trees on die-cast stands that lend the correct atmosphere to models of farm buildings, churches, etc. A further attraction are the wheels, finished in blue with white tyres, for constructing miniature wheel toys. The beautifully coloured instruction leaflet included in the Outfit illustrates a total of 44 models that any boy or girl can build.

Price **5/-**

No. 2 DINKY BUILDER OUTFIT

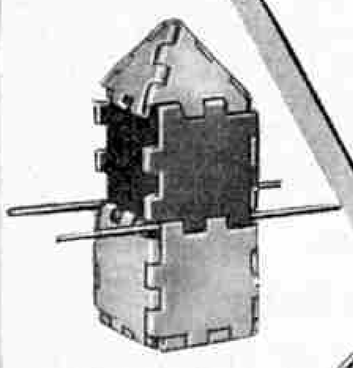
The No. 2 Dinky Builder Outfit contains a wide selection of parts primarily intended for the construction of realistic groups of miniature modern furniture. The small table lamp and shade that are included add greatly to the realism of these groups, particularly as the lamp can be lighted from an ordinary flash lamp battery. The coloured instruction leaflet gives examples of 7 furniture groups, but to an enthusiastic model builder the possibilities of the Outfit are practically inexhaustible.

Price **7/6**

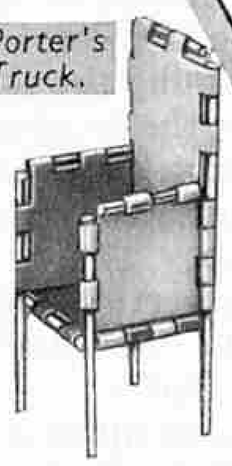
AN IDEAL CONSTRUCTIONAL TOY FOR BOYS AND GIRLS

No. 1 Dinky Builder Outfit.

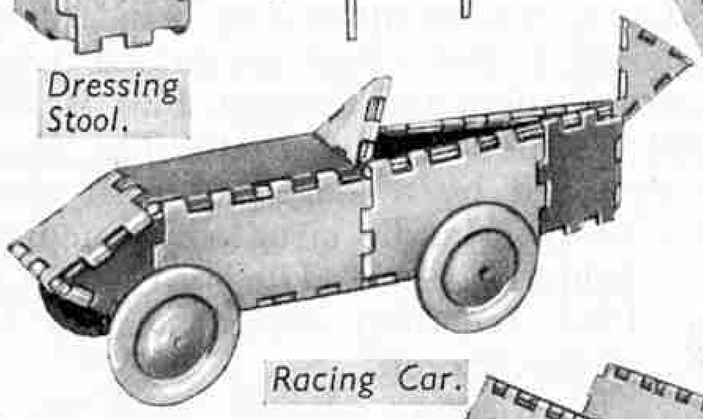
No. 2 Dinky Builder Outfit.

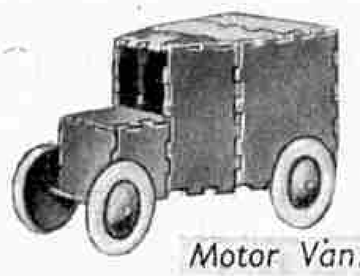

Sedan Chair.

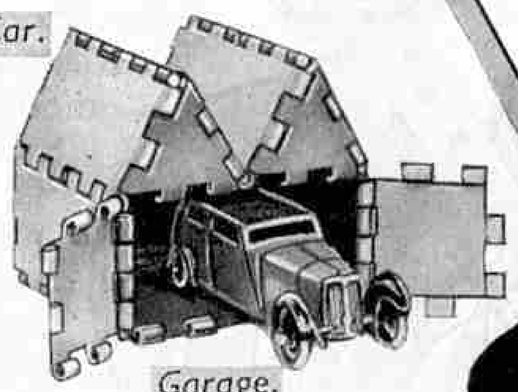
Porter's Truck.

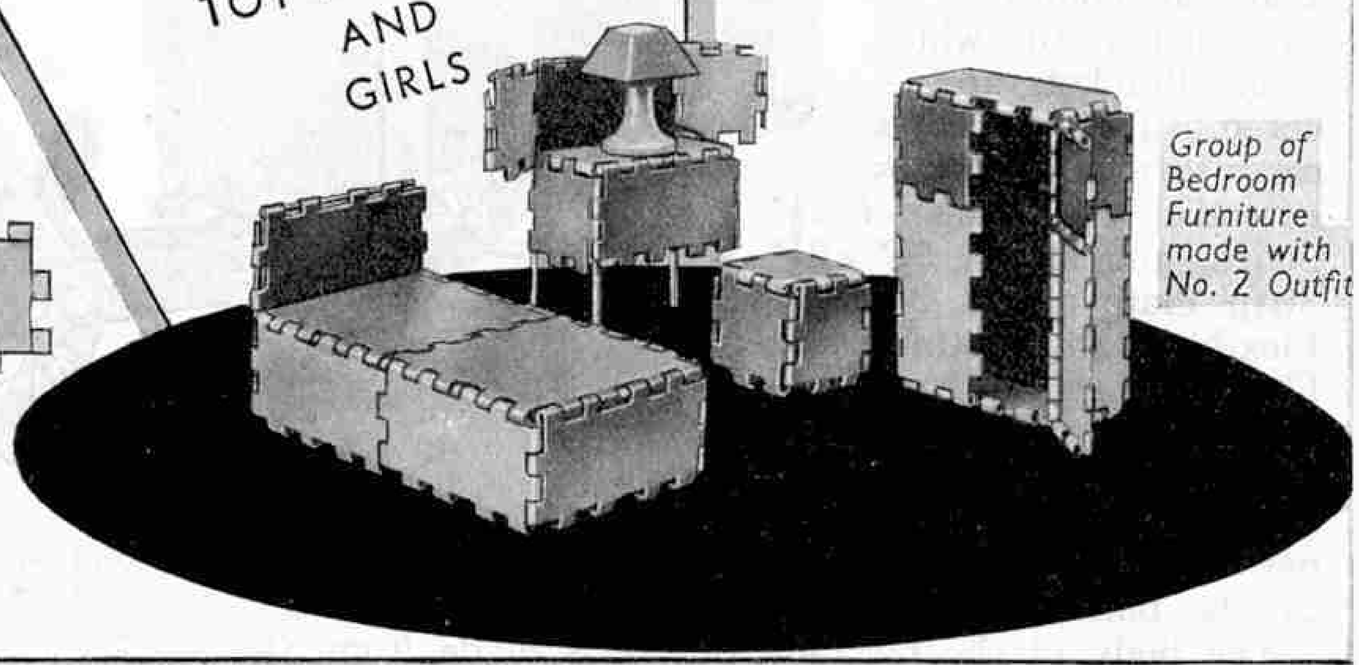

Arm Chair.

Dressing Stool.


Racing Car.


Motor Van.


Garage.


Group of Bedroom Furniture made with No. 2 Outfit

All the above models, and many others, can be made with No. 1 Dinky Builder Outfit.

Model-Building Competition Results

By Frank Hornby

"Spring" Contest (Overseas Section)

One of the most successful competitions organised during 1934 was the "Spring" Contest announced in the May issue of the "*M.M.*" This Contest was extremely well supported, and the proportion of outstanding models submitted, particularly in the Overseas Section, has seldom been equalled in any single competition. The task of judging was more than usually difficult, and the successful competitors have reason to be proud of their achievements in view of the fierce competition for the prizes. The results in the Home Sections have already been announced, and below I have pleasure in publishing the list of awards in the Overseas Section.

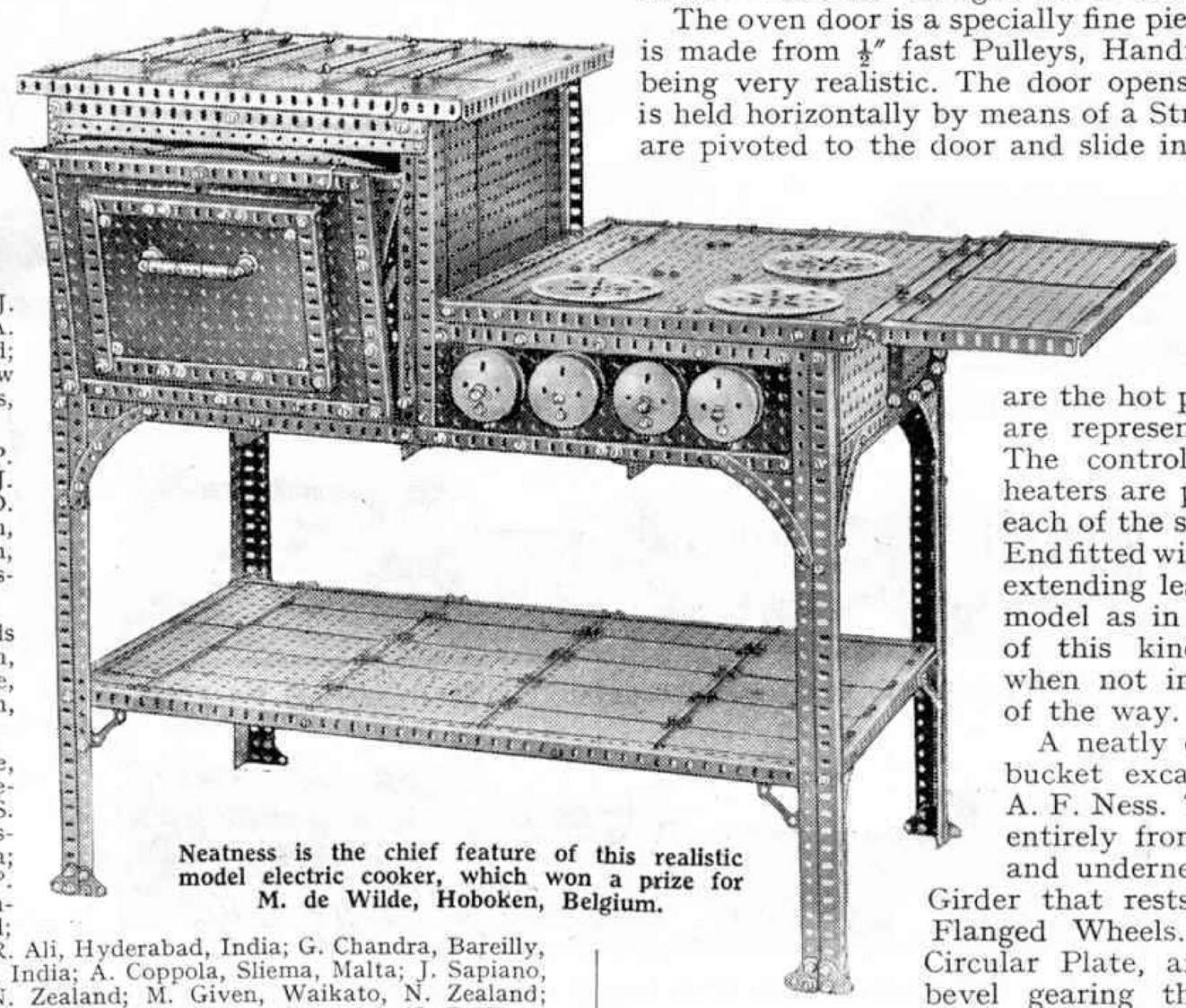
FIRST PRIZE, Meccano or Hornby Goods value £3-3s.: G. van der Mey, Lisse, Holland. SECOND PRIZE, Goods value £2-2s.: M. de Wilde, Hoboken, Belgium. THIRD PRIZE, Goods value £1-1s.: A. Ness, Port Dalhousie, Canada.

FIVE PRIZES of Goods value 10/6: R. Mulders, Angleur, Belgium; J. Valeton, Almelo, Holland; A. Bruton, Gisborne, New Zealand; P. Bruce Jones, Dunedin, New Zealand; P. Giese, Buenos Aires, Argentina.

FIVE PRIZES of Goods value 5/–: P. Wiener, Claremont, S. Africa; J. Rodriguez, Montreal, Canada; D. ten cate Brouwer Jr., Leiden, Holland; H. Holswilder, Leiden, Holland; T. Robson, Amman, Transjorden.

THREE CONSOLATION PRIZES of Goods value 2/6: R. Latimer, Rangoon, Burma; T. Schatborn, Overschie, Holland; E. Watkins, Alberton, S. Australia.

CERTIFICATES OF MERIT: D. Burne, Durban, S. Africa; J. Carter, Capetown, S. Africa; M. Lupton, S. Africa; P. Brown, Brisbane, Australia; F. Hinbest, Toronto, Canada; C. Leon, Toronto, Canada; P. Andersin, Brando, Helsingfors, Finland; K. Starre, Leiden, Holland; W. Mittenhout, Leiden, Holland; R. Ali, Hyderabad, India; G. Chandra, Bareilly, India; K. Joseph, Trichinopoly, S. India; A. Coppola, Sliema, Malta; J. Sapiano, Malta; P. Callister, Wairarapa, N. Zealand; M. Given, Waikato, N. Zealand; J. Parminter, Wairoa, H.B., N. Zealand; J. Reade, Raumarunui, N. Zealand; R. Kennedy, Christchurch, N. Zealand; K. McCullough, Dargaville, N. Zealand; D. Capelli, Buenos Aires, Argentina; J. Diehl, Buenos Aires, Argentina; J. Escary, Buenos Aires, Argentina; E. Malet, Perez Millan, Argentine; J. Roch, Cartagena, Spain; A. Schiffmann, Bale, Switzerland.



Neatness is the chief feature of this realistic model electric cooker, which won a prize for M. de Wilde, Hoboken, Belgium.

First Prize was awarded to Gerrit van der Mey, a blind Dutch boy. Readers will probably remember the fine model loom built by this competitor, which was described in the "*M.M.*" for December 1933. He owes his success in the "Spring" Contest to the fine workmanship displayed in a model carton wrapping machine. The model is very neatly built and is original in design. Splendid use has been made of the various Meccano parts contained in the model, and it speaks well for the builder's ability that he has so arranged the various parts of the mechanism in relation to one another, that the amount of shafting and gearing is reduced to a bare minimum.

A strip of paper enters the machine between guide Strips and passes beneath two Strips bolted face to face and spaced by Washers. A guillotine knife arranged to move in vertical slides passes between the Strips, and in doing so it cuts the paper into the required lengths. The paper is fed into the machine by Pulley Wheels fitted with Rubber Tyres. The two Strips between which the knife travels are raised from the base plate of the feeding mechanism during the time that the paper is being fed into the machine.

The boxes or cartons to be wrapped are all the same size and are supplied to the machine by means of a vertical chute, similar to that used in an automatic penny-in-the-slot machine. The boxes fall directly into the centre of the incoming wrapping paper, the sides of which are then folded vertically by means of two arms that travel upward close to the sides of the box. A second pair of folders next move inward across the top of the box and fold the paper over it, so that the edges then overlap. Previous to this motion, however, gum is applied to the paper. As soon as the paper has been folded right round the box the top folders are replaced by a weight. Other folding arms then move inward and upward across the ends of the box and press the ends of the paper neatly into place. The wrapped box is then discharged on to a simple belt conveyor and a second box takes its place in the machine.

The illustration on this page shows a neat model of a modern electric cooker which won Second Prize for M. de Wilde. By using coloured parts in conjunction with plated parts, the various sections of the model are brought out in sharp contrast.

The oven door is a specially fine piece of work, the handle, which is made from ½" fast Pulleys, Handrail Supports and Couplings, being very realistic. The door opens downward, and when open is held horizontally by means of a Strip at each side. These Strips are pivoted to the door and slide in Eye Pieces attached to the inside of the oven. When the door is fully open Collars on the free ends of the Strips rest on the Eye Pieces and prevent the door from falling.

On one side of the oven are the hot plates or heating rings, which are represented by 4" Circular Plates. The control switches for the various heaters are placed in front of the model, each of the switches consisting of a Boiler End fitted with a Handrail Support. A small extending leaf is fitted to one end of the model as in many actual electric ranges of this kind. The leaf is hinged and when not in use may be let down out of the way.

A neatly constructed model of a drag bucket excavator won Third Prize for A. F. Ness. The cab of the model is made entirely from Plates and Angle Girders, and underneath is fitted with a Circular Girder that rests on the flanges of four ¾" Flanged Wheels. The Wheels run on a 6" Circular Plate, and by means of worm and bevel gearing the complete crane can be rotated on its travelling base. The motive power is provided by an Electric Motor.

The model travels on creeper tracks built up from a series of 1½" Strips bolted to lengths of Sprocket Chain. The Chains pass round the rims of four wheels made from Bush Wheels and Wheel Flanges, and at the driving end the tracks are supported by a 1½" Pulley Wheel fitted with a Dunlop Rubber Tyre.

April "Aeroplane Constructor" Contest

The lists of awards in the Home and Overseas Sections of the "Aeroplane Constructor" Contest announced in the April 1934 "*M.M.*" are as follows:—

Section A (Home competitors over 14 years of age)

FIRST PRIZE, Meccano or Hornby Goods value £3-3s.: R. Storrar, Letham Ladybank, Fifeshire. SECOND PRIZE, Goods value £2-2s: R. Perrott, Bristol 6. THIRD PRIZE, Goods value £1-1s.: H. Taylor, Birmingham.

FIVE PRIZES of Meccano or Hornby Goods value 7/6: J. Gabbutt, Mellor; D. Peters, London, N.W.4; H. Stainton, Kendal; A. Taylor, Widnes, Lancs.; R. Williams, London, N.10.

Section B (Home competitors under 14 years of age)

FIRST PRIZE, Meccano or Hornby Goods value £3-3s.: R. Simpson, London. N.13. SECOND PRIZE, Goods value £2-2s.: R. Freestone, Gateshead-on-Tyne. THIRD PRIZE, Goods value £1-1s.: T. Neaves, Holbeach, Lincs.

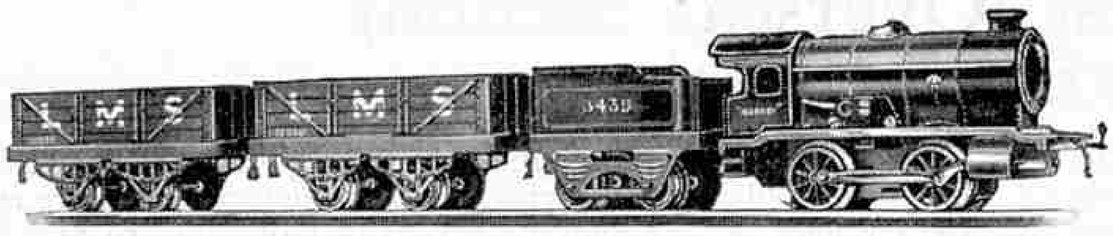
FIVE PRIZES of Meccano or Hornby Goods value 7/6: G. Earl, Luton, Beds.; A. Elliot, London, N. 18; H. Greenup, London, S.E.4; M. Paul, London, S.W.16; E Taylor, Bristol.

Section C (Overseas competitors)

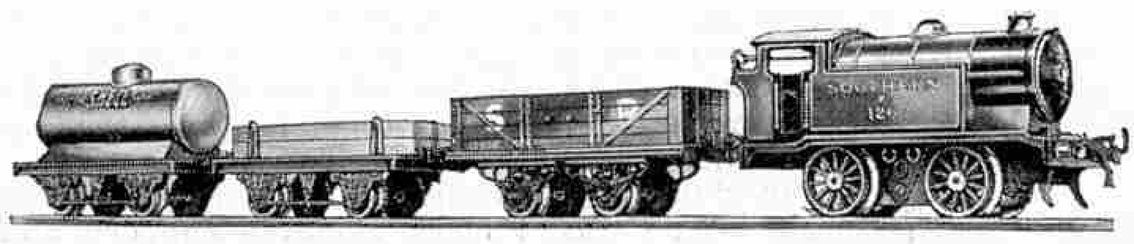
FIRST PRIZE, Meccano or Hornby Goods value £3-3s.: A. Rossi, Como, Italy. SECOND PRIZE, Goods value £2-2s.: P. Weishaupt, Odense, Denmark. THIRD PRIZE, Goods value £1-1s.: R. Latimer, Rangoon, Burma.

FIVE PRIZES of Meccano or Hornby Goods value 7/6: J. Pienaar, Johannesburg; J. Rodriguez, Montreal, Quebec; L. Huls, Amersfoort, Holland; G. Krajian, Aleppo, Syria; C. Costas, Buenos Aires, S. America.

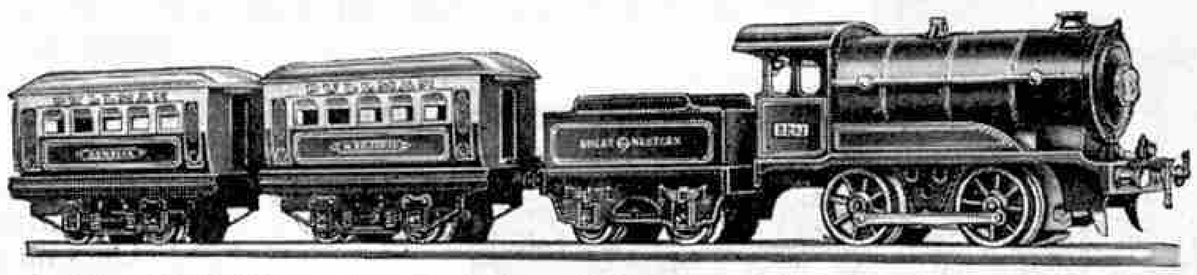
A Selection of Hornby Electric Train Sets



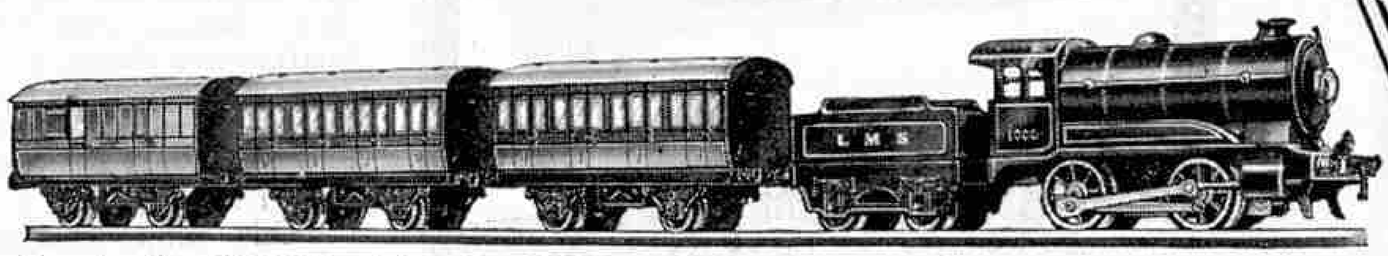
EM120 (20 volt) or EM16 (6 volt) Goods Train Set (non-reversing). Price **15/-**



EM320 (20 volt) or EM36 (6 volt) Tank Goods Train Set (reversing). Price **24/-**

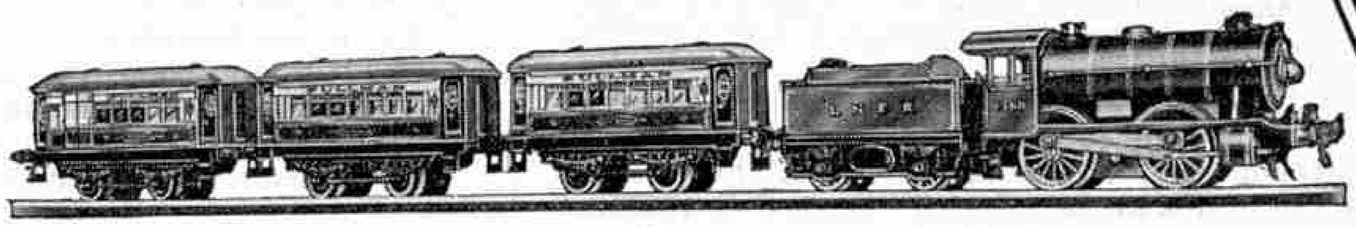


Hornby No. EO20 (20 volt) or EO6 (6 volt) Passenger Train Set (reversing). Price **31/6**

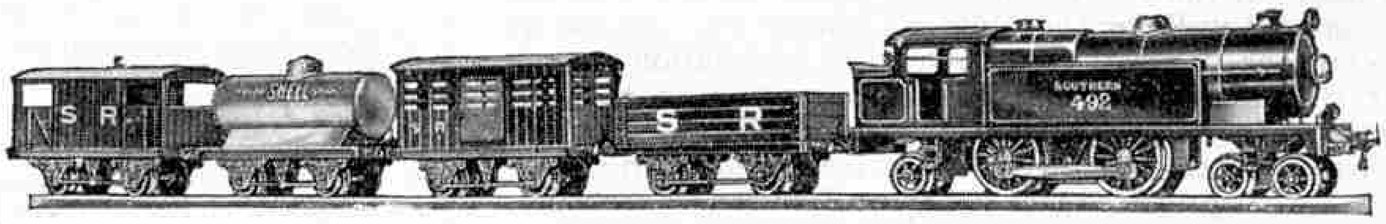


Hornby No. E120 (20 volt) or No. E16 (6 volt) Passenger Train Set (reversing). Price **38/6**

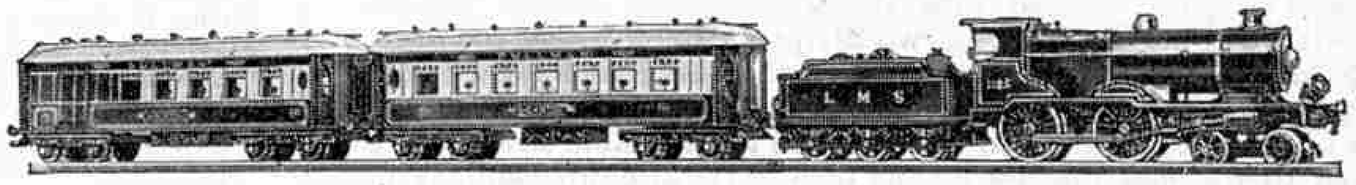
Hornby No. E120 Special Goods Train Set (20 volt, automatic reversing). Price **44/-**



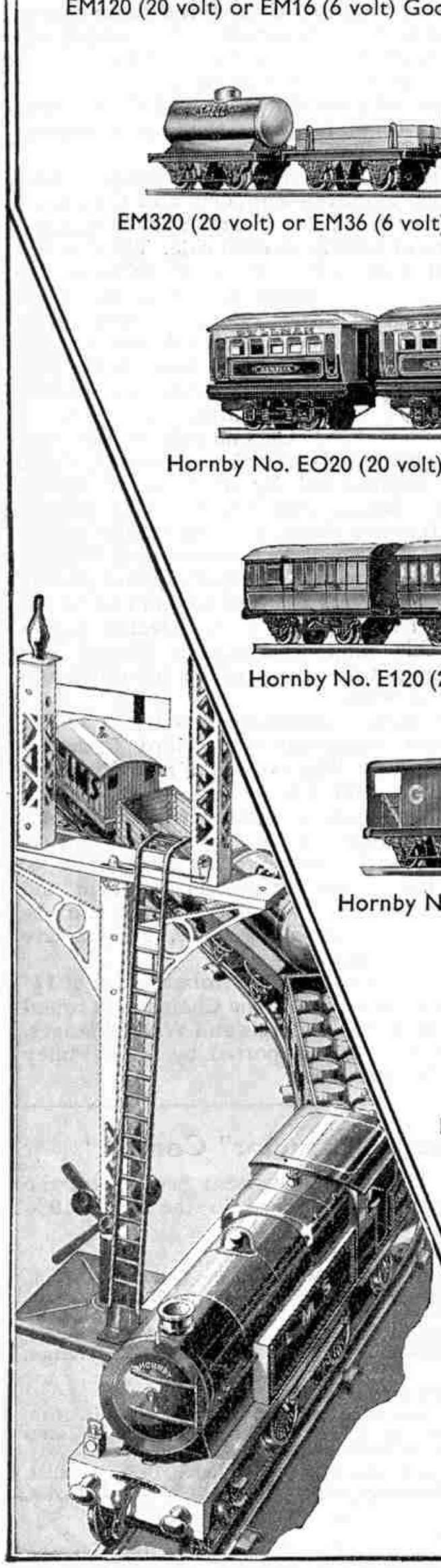
Hornby No. E120 Special Passenger Train Set (20 volt, automatic reversing). Price **48/6**



Hornby No. E220 Mixed Goods Train Set (20 volt, automatic reversing). Price **47/6**

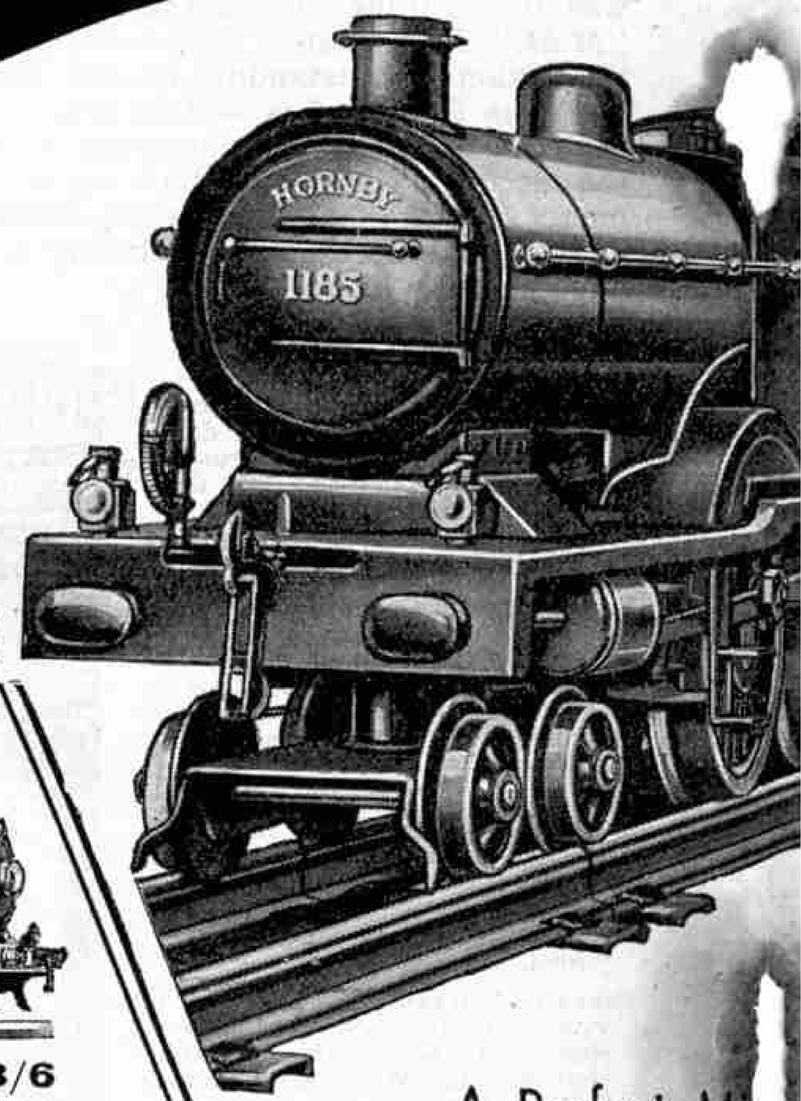


Hornby No. E320 Pullman Train Set (20 volt, automatic reversing). Price **72/6**



Prices of Hornby Electric Train Sets from 15/- to 75/-

HOR ELECTRIC AND TRA



A Perfect Mi

Hornby Electric and Clockwork T with boys because they enable railway practice to be carried ou

Hornby Locomotives are ma so smoothly. No others

Hornby Rolling Stock is fitted with automatic c includes every type seen

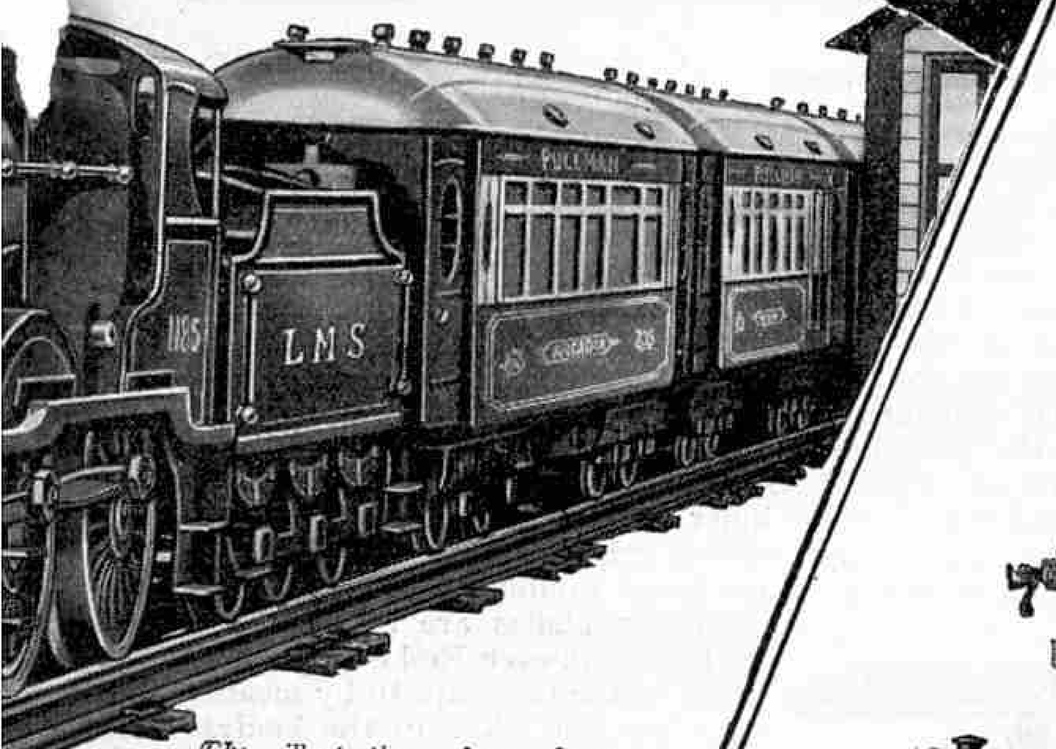
Hornby Accessories a correct proportion. everything a boy co make his railway a sentation of the

Get a copy of the of Trains (see pa and make yo This must Christmas boy who model

PRODU of MECC LIMITE LIVERPO

MANUFACTURED BY · MECCANO LIMITED ·

RNBY CLOCKWORK AINS



The illustration above shows Hornby No. 2 Special Train Set, hauled by a Hornby No. 2 Special Locomotive. This Locomotive is a true-to-type model of the real L.M.S.R. Standard Compound Locomotive.

ature Railway

ork Trains are such great favourites
nable almost every operation in
ed out accurately and efficiently.

e magnificent. No others run
ers pull such heavy loads.

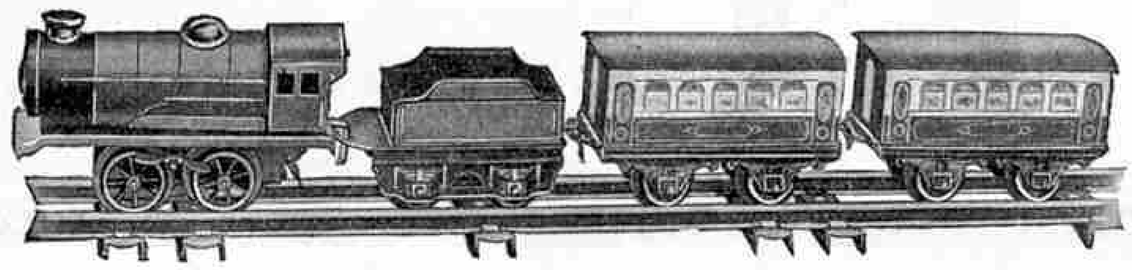
k is smooth-running and is
ic couplings. The range
een on the big railways.

es are realistic, and in
on. They provide
y could wish for to
y a complete repre-
f the real thing.

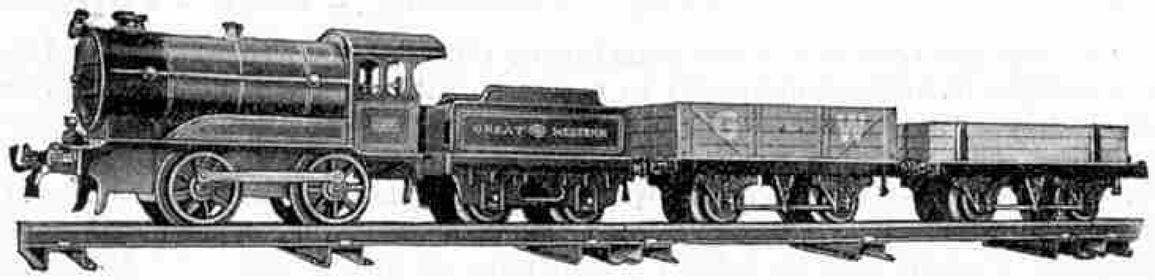
the Hornby Book
e page II of cover)
choice now.
a Hornby
or every
keen on
trains!

PRODUCT of MECCANO LIMITED LIVERPOOL

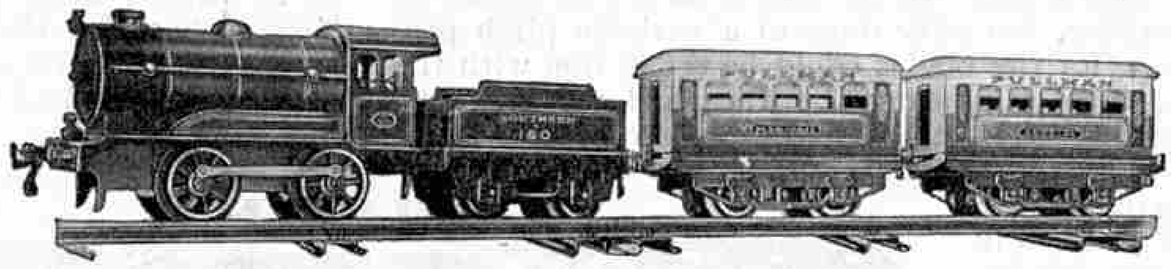
A Selection of Hornby Clockwork Train Sets



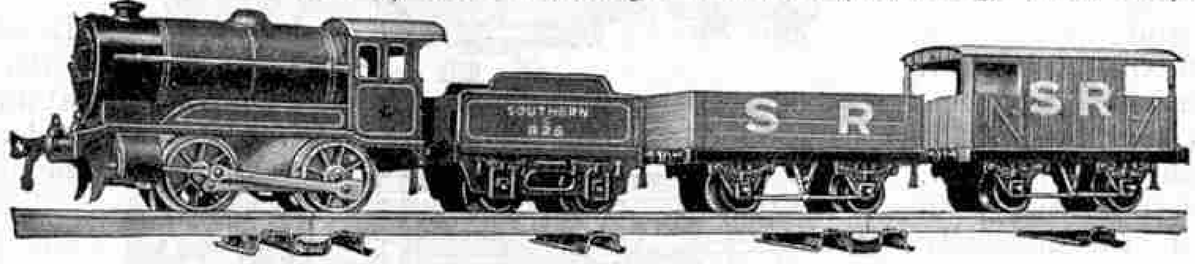
MO Passenger Train Set. Price **5/6**



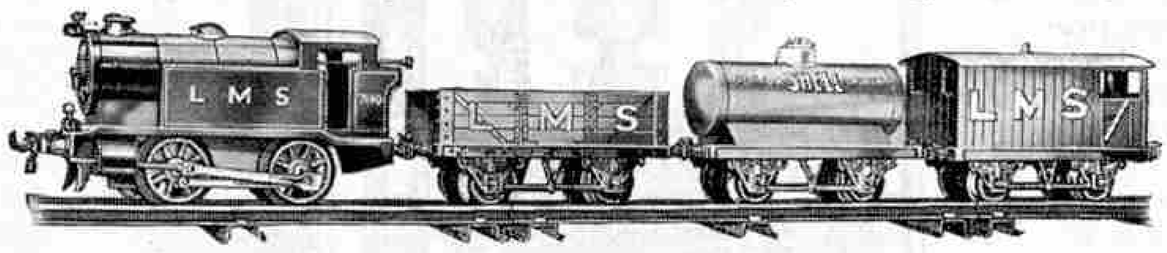
Hornby No. O Goods Train Set (reversing). Price **17/6**



Hornby No. O Passenger Train Set (reversing). Price **16/11**

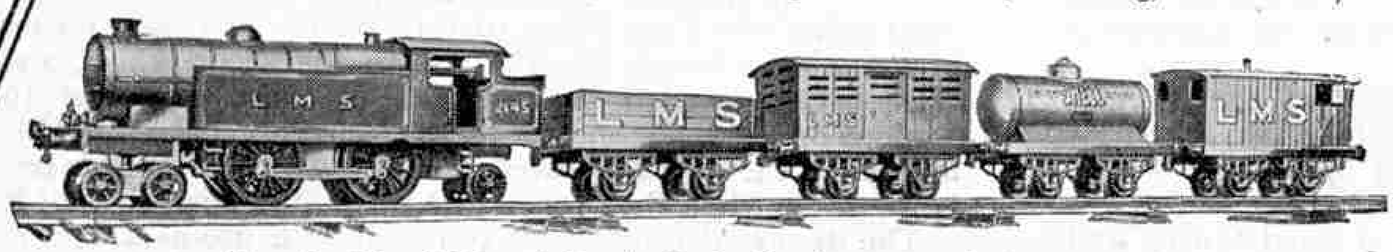


Hornby No. 1 Goods Train Set (reversing). Price **22/6**

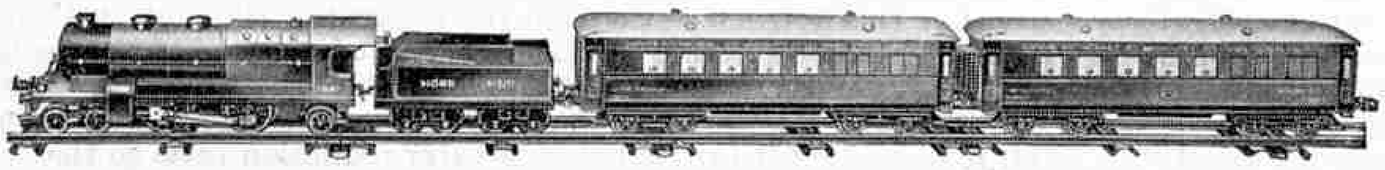


Hornby No. 1 Tank Goods Train Set (reversing). Price **22/6**

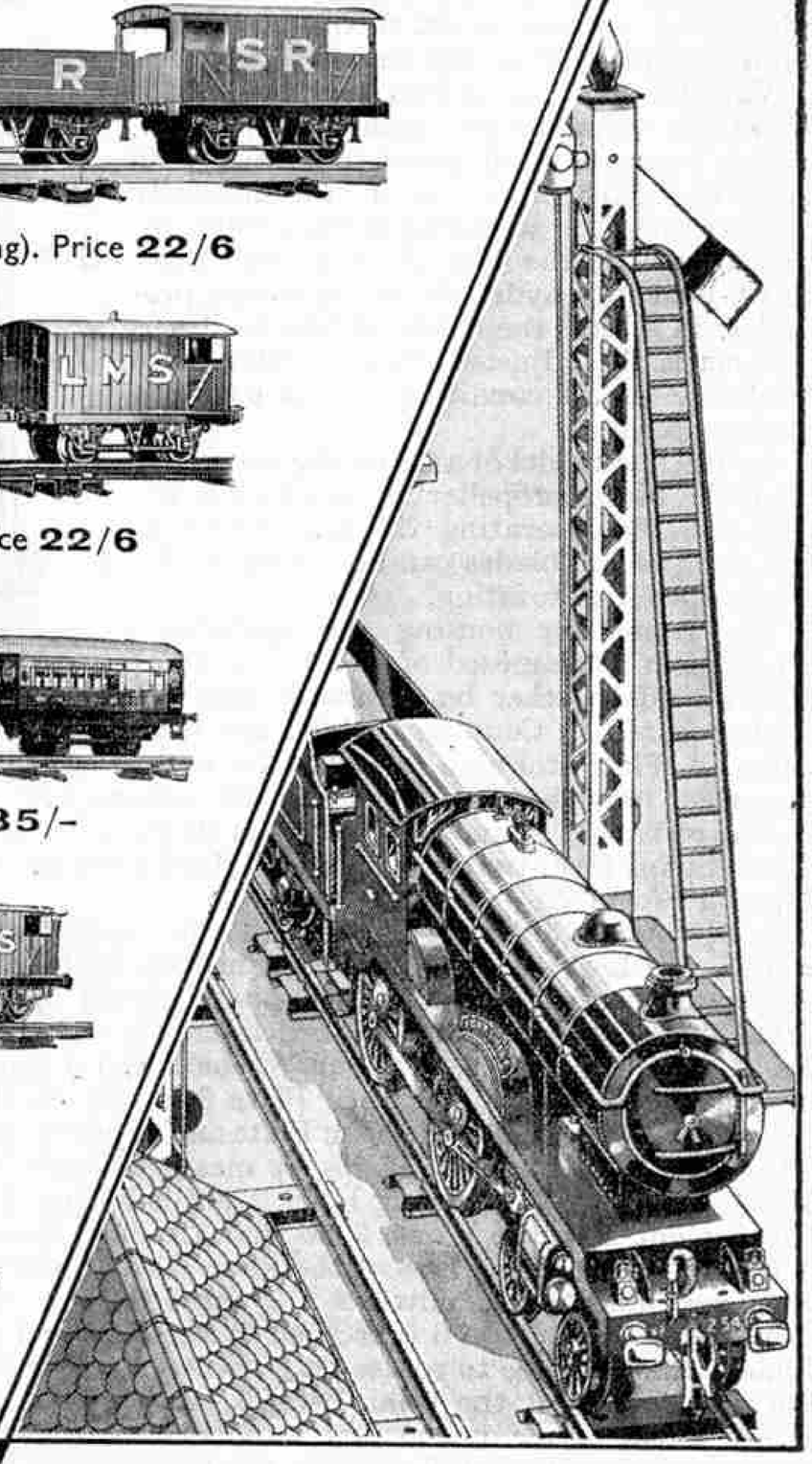
Hornby No. 1 Special Passenger Train Set (reversing). Price **35/-**



Hornby No. 2 Mixed Goods Train Set (reversing). Price **36/-**

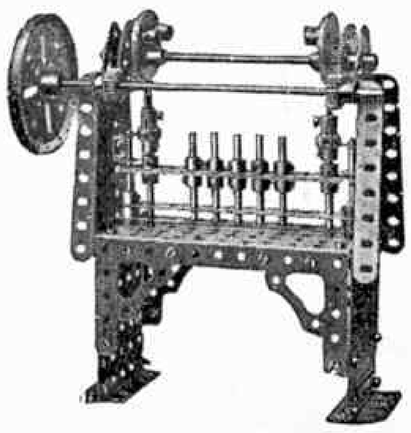


Hornby No. 3C Riviera "Blue" Passenger Train Set (reversing). Price **58/6**



· BINNS ROAD · LIVERPOOL · 13 ·

Prices of Hornby Clockwork Train Sets from 4/11 to 65/-



Suggestions Section

Edited by "Spanner"

(316)—Variable Pitch Propeller (S. Williamson, Liverpool)

An aeroplane engine operates with maximum efficiency when running at a certain definite speed, and in order to maintain this speed continuously, regardless of the conditions in which the engine is working, the variable pitch propeller has been devised. The pitch of the blades can be varied while the aeroplane is in flight, thus enabling the engine to cope with varied conditions at a constant speed. Conditions in which variations of pitch are necessary occur, for instance, when a machine is climbing, gliding, and flying at different altitudes. In the case of an engine failure in a multi-engined machine, the advantage of a variable pitch propeller would be great, for the blades could be set in line with the direction of travel, thus minimising the drag and reducing the difficulty of controlling the partially disabled machine. Another instance where a propeller of variable pitch is particularly useful is in airships, which require to be reversed in flight. By turning the blades, the propellers can be converted from tractors to pushers, and vice versa; or may be set to the position of minimum drag when not in use.

Variable pitch propellers may be divided into three main groups—manually operated, power operated, and power operated with gear in which a governor automatically adjusts the pitch according to the conditions prevailing. In the last class is the Hele-Shaw-Beacham hydraulically operated propeller, in which the pitch of the blades is automatically adjusted to give maximum efficiency in all conditions, at a constant engine speed.

A Meccano model of a manually operated variable pitch propeller is illustrated in Fig. 316. By operating the handwheel 1 the pitch of the blades can be varied while the propeller is rotating.

The frame for housing the operating mechanism is composed of two 4″ Circular Plates held together by means of four 3″ Rods secured in Couplings which are bolted to the Plates by ½″ Bolts. A Flat Trunnion is bolted to each Plate, the two being arranged immediately opposite each other, and connected by means of two 3″ Strips that are fixed in place by Angle Brackets. These Strips form bearings for the 3″ Rod carrying the handwheel 1 and a Worm 2.

A 6½″ Axle Rod is journalled in the centres of the Circular Plates, the lower bearing being formed by bolting two 1″ Strips across the centre hole, and the upper bearing by a Bush Wheel fitted in a manner to be described later. On the lower end of the Rod, inside the Plates, are four Washers and a fixed Collar, and immediately above this a Face Plate 3 is free on the Rod. Four 1½″ Strips are bolted to the Face Plate and support the Gear Ring 4, which is spaced from the Strips by means of two Collars and two Washers on each ¾″ securing Bolt. The Gear Ring 4 is in constant engagement with the Worm 2, so that although the central Rod 5 is free to rotate in the boss of the Face Plate 3, the latter remains stationary until the handwheel 1 is turned.

A second Face Plate 6 is secured to the Rod and carries two ½″ Pinions that are free to rotate on ¾″ Bolts. The Pinions mesh with the inner teeth of the Gear Ring 4, and with a 57-teeth Gear Wheel 7 that is free on the Rod 5 and spaced from the Face Plate 6 by means of five Washers. The Gear carries a Socket Coupling fitted with a second 57-teeth Gear Wheel 8. This Gear engages ½″ Pinions that are free to rotate on ¾″ Bolts fixed to the Face Plate 9.

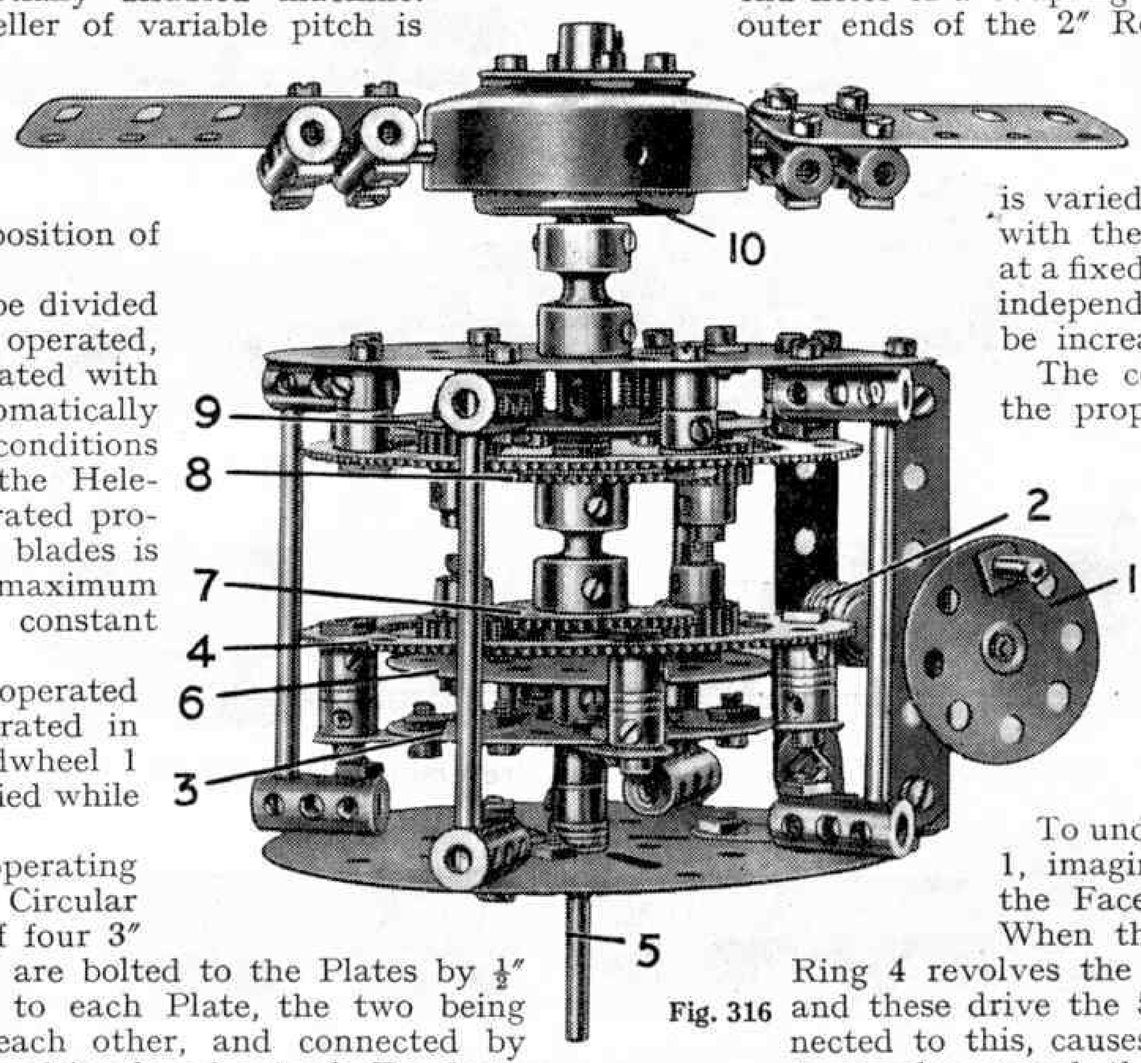


Fig. 316

The Face Plate 9 is free on the Rod 5, and the ½″ Pinions are in continual engagement with a Gear Ring secured to the upper 4″ Circular Plate by means of four ¾″ Bolts, but spaced by means of two Collars and a Washer on each.

The Face Plate 9 is provided with four ⅜″ Bolts that engage the perforations in a Bush Wheel, the boss of which passes through the centre hole of the upper Circular Plate. The Bush Wheel is free to rotate on the Rod 5, and its boss carries a Socket Coupling in which the 1½″ Contrate Wheel 10 is secured.

A boss for the propeller is formed from a Boiler End fitted with a Bush Wheel. Two 2″ Axle Rods are inserted into opposite holes in the Boiler End, their inner ends being journalled in the end holes of a Coupling that is gripped on the Rod 5. The outer ends of the 2″ Rods carry Couplings to which the propeller blades are attached. A ½″ Pinion on each Rod engages the teeth of the Contrate 10 by means of which the pitch of the blades is varied. While the Contrate rotates solid with the Rod the propeller blades remain at a fixed pitch; but by rotating the Contrate independently of the Rod, the pitch can be increased or reduced at will.

The central 6½″ Axle Rod 5, carrying the propeller, is driven from the engine. As it rotates, the Pinions on the Face Plate 6 rotate round the inner teeth of the Gear Ring 4 and drive the 57-teeth Gear 7. The Gear 8 causes the ½″ Pinions on the Face Plate 9 to rotate round the upper fixed Gear Ring, and by this means the Face Plate 9 rotates at the same speed as the Rod. Thus the Contrate 10 also rotates solid with the Rod.

To understand the effect of the handwheel 1, imagine the propeller shaft, and hence the Face Plate 6, to be held stationary. When the handwheel is rotated the Gear Ring 4 revolves the Pinions on the fixed Face Plate, and these drive the 57-teeth Gear 7. The Gear 8, connected to this, causes the Pinions on the Face Plate 9 to revolve round the upper Gear Ring. In so doing they cause the Face Plate to turn on its Rod, and its movement is conveyed through the ⅜″ Bolts to the Bush Wheel, and by the Socket Coupling to the Contrate 10. The Contrate turns the Pinions on the inner ends of the Rods carrying the propeller blades, and thus the pitch is altered. The operation of the mechanism is the same when the propeller is revolving, regardless of its speed.

The device as illustrated is intended for use as a demonstration model only. The mechanism is interesting to construct and the ingenious method of operation is very fascinating. It is, of course, too large for incorporation in a Meccano model aeroplane of normal size, but this detracts little from the interest of the device. It may be mounted on a suitable base and the shaft 5 coupled to an Electric Motor. Several stages of reduction gearing between the Motor armature and the propeller shaft will be necessary for fast running, but it is a good idea to include a greater reduction ratio so that the blades rotate sufficiently slowly for observation of their movement.

In the illustration, Flat Girders are used for propeller blades for compactness. They are not intended to be true to scale but to show the variations of pitch. If desired they can be replaced by built-up blades of larger size, or by parts No. 41 secured by bolts to two Collars on each Rod.

(317)—Simple Cam Movement

(J. Brandreth, Hull)

An ingenious type of cam that can be applied to many useful purposes is shown in Fig. 317. The camshaft carries two Collars 1 that are each fitted with a 5/32″ Bolt. The bolts should be directly in line with each other to ensure smooth working of the device.

The tappets are carried on two 1″ Rods held in a Coupling and carrying Eye Pieces at the outer ends. The Eye Pieces slide on 2″ Strips bolted to a 2½″ × 1″ Double Angle Strip at the base. Each of the 1″ Rods carries three Washers 2 that are held in place between the Eye Pieces and Collars. Sufficient clearance should be allowed so that the Washers are able to revolve freely on the Rods. As the camshaft rotates, the Bolts in the Collars 1 strike the Washers and force them upward. Two light rubber bands 3 return the tappet rod to its original position.

The cords shown attached to the Coupling are, in this case, used for operating the mechanism for which the cams are required, but other suitable operating gear may be fitted according to the special requirements.

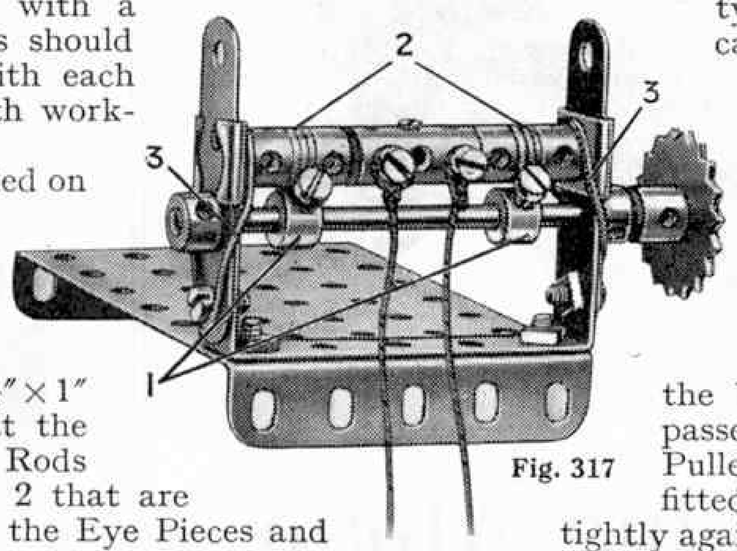


Fig. 317

(318)—Balloon Tyre

(L. Gordon Loos, Colombo)

A giant balloon tyre or air wheel is illustrated in Fig. 318. The method of making this is extremely novel, and by this means tyres of various sizes can be made.

The essential part is a rubber ball of fairly stiff rubber. The size of the finished tyre will of course be dependent upon the size of the ball chosen. A hole is punched through the centre of the ball and an Axle Rod passed through. Two 1½″ Pulleys, or Bush Wheels, are fitted on the Rod, and placed tightly against the sides of the ball with their bosses inward. In this manner the ball is compressed to represent wheel and tyre as illustrated. The bolts on the 1½″ Pulley do not serve any useful purpose, but are fitted to enhance the appearance of the finished wheel; and a ¾″ Flanged Wheel is mounted on the Rod for the same purpose.

Wheels made in this manner are particularly suitable for models of heavy motor lorries and motor buses, etc. They also make realistic landing wheels for aeroplanes.

(319)—Level Luffing Gear (R. Peters, Birmingham)

In the usual type of crane a considerable effort is necessary in order to raise the jib, and when a load is imposed on the crane hook a greater effort becomes necessary for the luffing operation. The effect can be imagined by assuming the hoisting drum to remain stationary while the jib is raised. The load is then raised with the jib, so that the luffing barrel has to cope with the weight of the jib plus the weight imposed by the load. In practice this means a considerable increase in operating costs, and various forms of level luffing gear have been devised to eliminate the unnecessary load on the luffing barrel.

The illustration in Fig. 319 shows the Babcock and Wilcox type of level luffing gear, the essential feature of which is an extension at the jib head. This is represented in the Meccano model by means of a 3″ Pulley Wheel to which an arm consisting of 2½″ Strips is rigidly attached. The Pulley complete with arm is free to pivot about a Rod passed through the jib head, and this Rod carries a ½″ loose Pulley. At the end of the arm is a 1″ Screwed Rod carrying a further ½″ loose Pulley, and the hoisting cord passes over these two ½″ Pulleys and through the Single Sheave Pulley Block, and is tied to the centre of the arm. A length of cord is secured to the 3″ Pulley as shown and its other end is tied to the A frames of the crane.

Luffing is effected by means of a lever pivoted at its centre near the tops of the A frames and connected at one end to the jib by pivoted connecting links and at the other end to the operating mechanism, which in this case consists of a Screwed Rod driven from a handwheel through Bevel Gears. The Rod passes through the centre bore of a Coupling pivoted to the lever, and its lower end is screwed into a Threaded Coupling on the Rod carrying one of the Bevels.

When a load is suspended from the Pulley Block it tends to pull down the short lever that pulls on its cord and tends to raise the jib. This tendency greatly reduces the pull on the luffing mechanism, which can be operated by means of a much smaller power unit than would otherwise be necessary with ordinary luffing gear.

When the jib is lowered, the cord attached to the 3″ Pulley raises the short arm and thus raises the load hook in relation to the jib. By this means the load moves approximately horizontally during the luffing operation. In addition to effecting an economy in running costs, the level luffing gear simplifies considerably the task of the crane driver in depositing loads exactly where they are required.

The advantages of level luffing gear are particularly apparent in the handling of ships' cargoes. Cranes on the quay side must be luffed continually in order to handle loads on the quay and in the ships' holds.

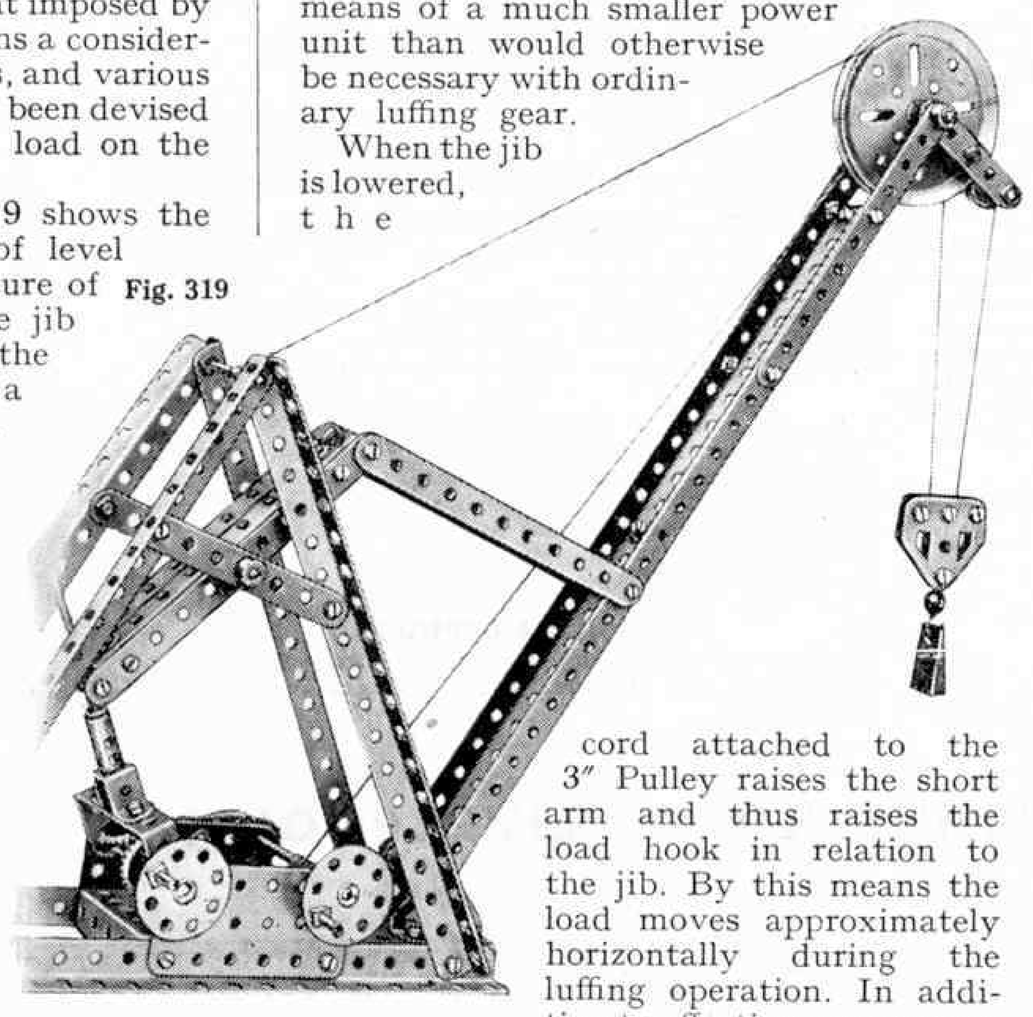


Fig. 319

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(**M.174.**) **Meccanograph Pencil.**—Various schemes have been devised for tracing designs on the Meccanograph, and one of these is to employ a blunt point to trace out the design on the upper side of carbon paper, which transfers the impression to a sheet of paper placed underneath it. L. S. Osborne (Dandenong, Victoria, Australia), uses an Axle Rod that has been filed down to a point suitable for this method of producing designs. The method of mounting the Rod is worthy of note. A Crank is bolted to one end of a 3½″ Strip and carries the Rod, the upper end of which is fitted with a 1″ Gear that gives the point the requisite pressure for tracing the design. The Strip is pivoted on a Hinge that is bolted in the third hole from its other end, and at the end of the Strip are two Compression Springs that tend to press the point downward. The Hinge is bolted to an Angle Bracket on the writing arm, and one of the Compression Springs is held between the shanks of bolts, the second being fitted on a ¾″ Bolt. The upper end of the shank of this Bolt engages the hole at the end of the pivoted arm and prevents side movement.

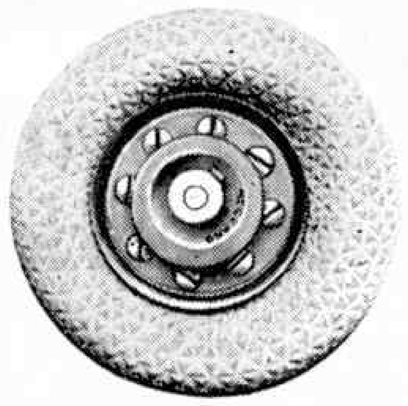


Fig. 318

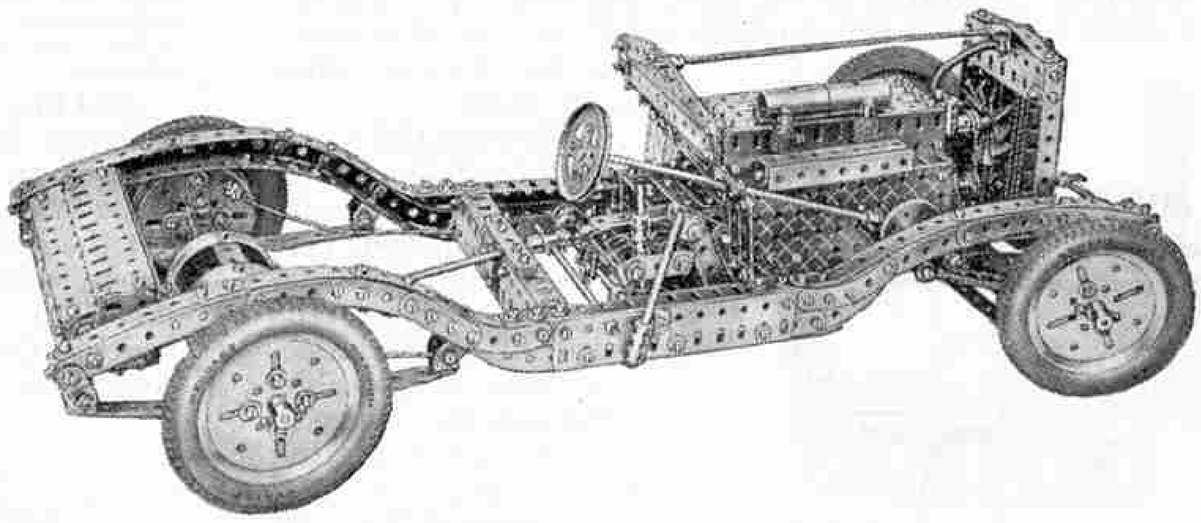
In tracing designs by this method it is advisable to place a thin sheet of paper above the carbon paper to prevent it from being torn, and the position at which the point starts the design should be indicated by a pencil mark so that it will be known when the design is finished.

(**M.175.**) **Compact Ratchet Gearing.**—A pawl and ratchet mechanism that takes up very little space is suggested by S. Kendall (Auckland, N.Z.). The device is suitable for purposes where a light ratchet brake is required, and consists of a ½″ Pinion Wheel, the teeth of which are engaged by a Spring Clip. The Clip is held on a Rod journalled in the hole next to the one carrying the Rod of the Pinion, and on the same Rod as the Clip is a Collar fitted with two Threaded Pins. The lower Pin carries two Collars that serve as a weight to keep the Spring Clip in engagement with the Pinion.

A great advantage of this arrangement is that the Ratchet can be reversed in a matter of seconds, by turning the Spring Clip on the Rod.

(**M.176.**) **Co-axial Reduction Gear.**—The chief advantages of the reduction gear suggested by N. Kember (London, N.11) are its compactness and the fact that the driving and driven shafts are co-axial. The gearing provides a reduction ratio of 2 : 1. A ¾″ Contrate is carried on the driving shaft which is inserted in one end of a Coupling, in the other end of which the driven shaft is inserted. The driven shaft carries a 1½″ Contrate and both Contrates engage a ¾″ Pinion rotating idly on an Axle Rod fixed at right angles to the driving and driven shafts. The ¾″ Contrate drives the Pinion, and the Pinion drives the 1½″ Contrate on the driven Rod.

This fine Meccano model of a Motor Chassis is driven by a 6-volt Meccano Electric Motor.



—*I want a Meccano Motor to work my Meccano models*"

In order to obtain the fullest enjoyment from the Meccano hobby you should operate your models with a Meccano Motor or Steam Engine. Each power unit in the series is strongly made and the utmost care is taken in its manufacture to ensure that it will give satisfaction. The side plates and bases are pierced with the standard Meccano equidistant holes, which enable the Motor or Steam Engine to be built into any model in the exact position required.

Meccano Clockwork Motors

These are the finest clockwork Motors obtainable for model driving. They have exceptional power and length of run and their gears are cut with such precision as to make them perfectly smooth and steady in operation.

X SERIES CLOCKWORK MOTOR. A fine Motor specially designed to drive with ease any of the X Series models. It is non-reversing ... ... Price 2/6

No. 1 CLOCKWORK MOTOR. An efficient and long-running Motor fitted with a brake lever. It is non-reversing. Price 5/–

No. 1a CLOCKWORK MOTOR. The Motor is more powerful than the No. 1 Motor and is fitted with reversing motion. It has start, stop and reverse levers. Price 7/6

No. 2 CLOCKWORK MOTOR. This is a Motor of super quality. Brake and reverse levers enable the Motor to be started, stopped or reversed, as required ... Price 10/–

MECCANO STEAM ENGINE .. .. .. Price 25/–

Meccano Electric Motors

The five Meccano Electric Motors listed below provide smooth-running power units for the operation of Meccano models. The 6-volt Motors may be operated either from a 6-volt Accumulator or through a Transformer direct from the mains, providing that the supply is alternating current. They cannot be run satisfactorily from dry cells. The 20-volt Motors are most conveniently operated through a 20-volt Transformer from alternating current supply mains.

No. E1 Electric Motor (6-volt). Non-reversing.	Price 9/–
No. E6 Electric Motor (6-volt). Reversing ...	,, 15/6
No. E120 Electric Motor (20-volt). Non-reversing	,, 10/–
No. E20A Electric Motor (20-volt). Non-reversing	,, 16/6
No. E20B Electric Motor (20-volt). Reversing	,, 18/6

Meccano Transformers

Meccano Transformers provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.
All Meccano Transformers are available for the following Alternating Current supplies: 100/110 volts, 50 cycles; 200/225 volts, 50 cycles; 225/250 volts, 50 cycles. They can be specially wound for other supplies.
In ordering a Transformer the voltage and frequency of the supply must be stated.

No. T6A Transformer (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

No. T6 Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T6M Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. This is similar to No. T6, but is not fitted with a speed regulator ... Price 12/6

No. T20A Transformer (Output 35 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with 5-stud speed regulator ... ... Price 17/6

No. T20M Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. This is similar to No. T20, but is not fitted with speed regulator. Price 12/6

Accumulators

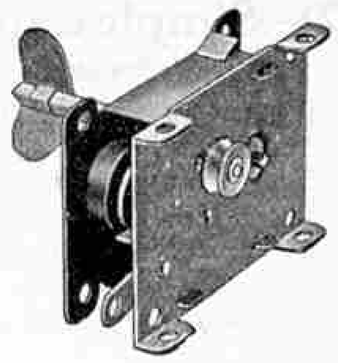
The Meccano 6-volt Accumulator is specially suitable for running all 6-volt Electric Motors and 6-volt Trains. The Meccano 2-volt Accumulator is supplied for converting 4-volt Accumulators to 6 volts.

Meccano 6-volt 20-Amp. Hr. Accumulator ... Price 27/9
Meccano 2-volt 20-Amp. Hr. Accumulator ... ,, 9/3

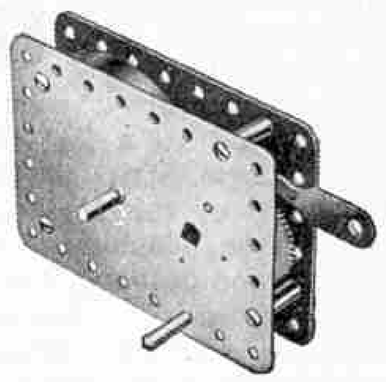
Resistance Controllers

By the use of these Controllers the speed of Meccano Electric Motors and Hornby Electric Trains can be regulated as desired ... ... Price (6-volt or 20-volt) 3/9

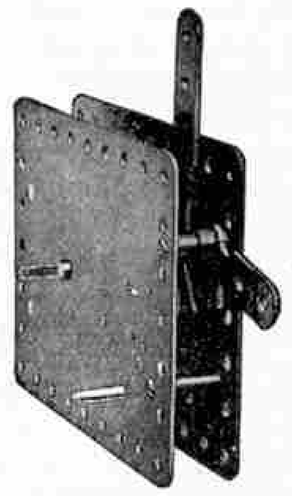
MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13



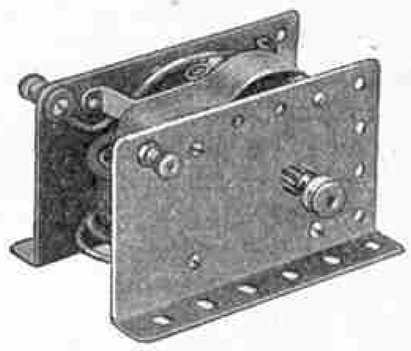
X Clockwork Motor



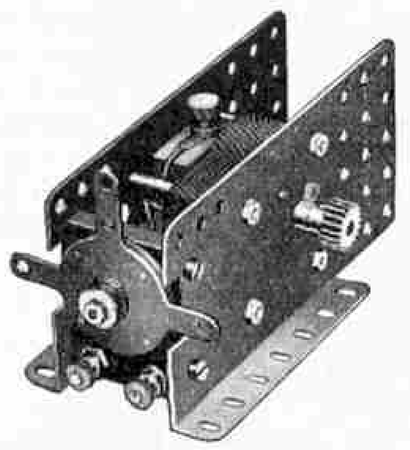
No. 1 Clockwork Motor



No. 2 Clockwork Motor

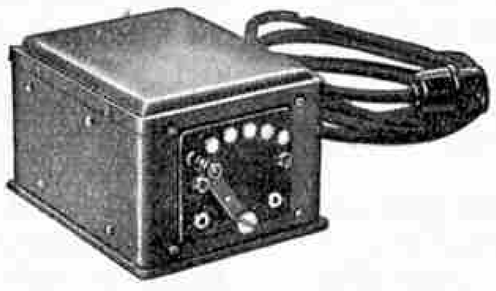


No. E120 Electric Motor (20-volt)



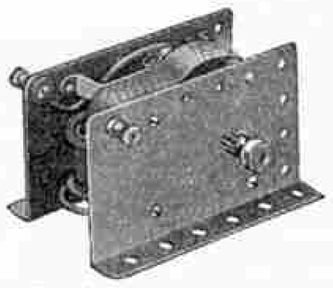
No. E6 Electric Motor (6-volt)

6-volt Accumulator

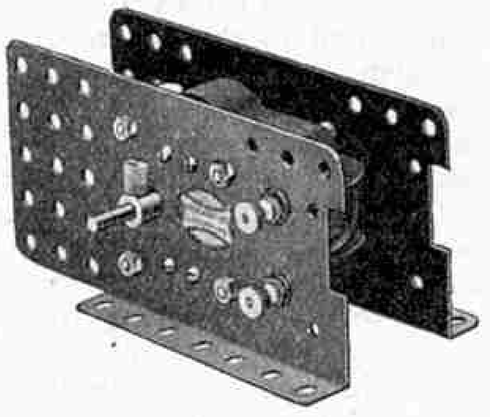


No. T20 Transformer

Resistance Controller



No. E1 Electric Motor (6-volt)



No. E20a Electric Motor (20-volt)

Illuminating Meccano Models

Fascinating Effects with New Lighting Set

MOST Meccano boys are familiar with the fascinating appearance of the large models illuminated by electric lamps that are displayed at Christmas time in the windows of Meccano dealers. Similarly attractive effects can be produced by illuminating smaller models, and to enable this to be carried out there has been introduced the new Meccano Electric Lighting Set.

The parts contained in the Lighting Set are shown in Fig. 2. They consist of two lanterns, one stand lamp, two special brackets, and two pea lamps. The lanterns are intended for use as the headlamps of model cars or for flood-lighting purposes. The chromium-plated fronts are detachable, and three pairs of celluloid discs are supplied to fit. One pair is coloured green, and another red; while the third pair is of clear celluloid to represent the anti-dazzle fronts that are often fitted to the lamps of present-day cars. Two special brackets are supplied for fixing the lamps in position, as desired, on Meccano models. The two pea lamps included are each fitted to a length of twin flex, and clips are provided for connecting them to a flashlamp battery. The clips grip the brass strips on the battery, and are fitted with terminals for connecting the wires from the lamps. The stand lamp, complete with shade, is intended for decorative purposes, and is particularly effective when used with models of various items of furniture.

An ordinary 4-volt flashlamp battery should be used for lighting the lamps. This battery is not supplied with the Set, but can be obtained from any electrician or cycle dealer. It is important that the lamps should not be connected to a battery with a greater voltage than 4.5. If desired, they can be lighted from the 3.5-volt output sockets on the Meccano Transformers T6A and T20A.

A few typical uses of the Lighting Set are illustrated on this page. The use of the lanterns as headlamps is seen in Fig. 3. Here they are attached by means of Flat Brackets to the radiator of the model car, the battery being housed quite conveniently beneath the bonnet. Each pea lamp is held in a slot in the back portion of the headlamp, the bulb being inserted before the front of the headlamp is fitted in position. The front fits tightly over the back to hold in place both the celluloid disc and the pea lamp in its slot.

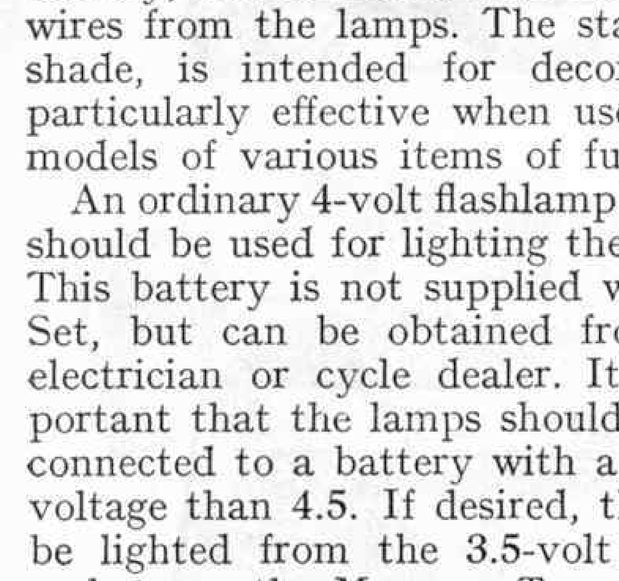


Fig. 3. Headlamps on a model Car.

Fig. 1 shows a model drilling machine with an inspection lamp in position to light up the work table. In this case the lamp is attached by its special bracket to an Angle Bracket mounted on an extension of the frame of the drill. The small sleeve of the pea lamp can be seen protruding from its slot, and at the rear of the drill are two terminals and clips for connection to the battery.

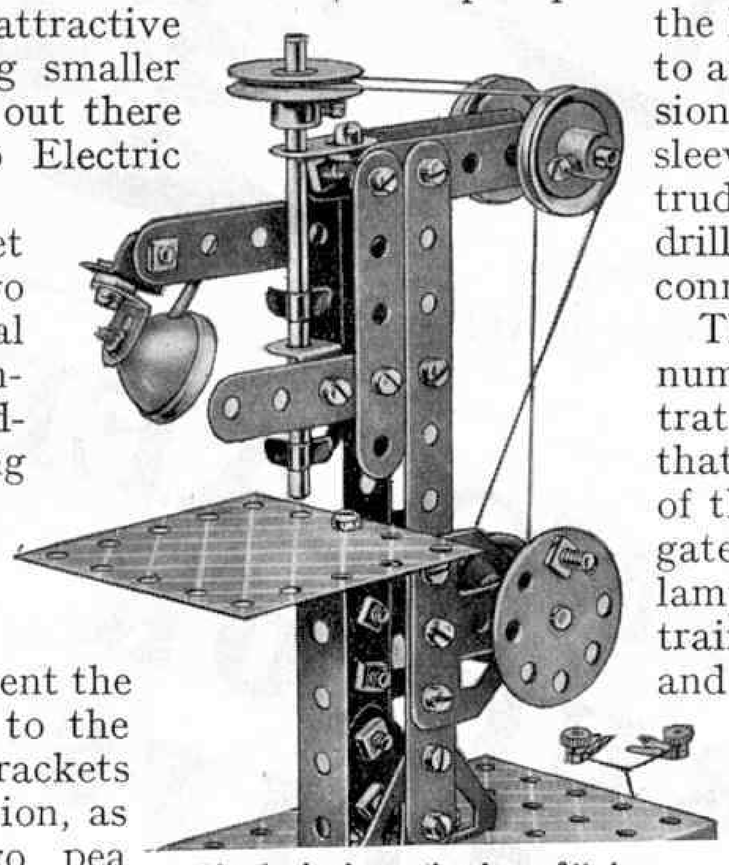


Fig. 1. An inspection lamp fitted to a model Drilling Machine.

The applications of these lamps are very numerous, and a few of them are illustrated in the Instruction Manuals. Models that are greatly improved by the addition of the lamps are buffers and level-crossing gates, in which the red front is fitted in the lamps to indicate danger to oncoming trains or road traffic. By mounting a red and a green lamp together a colour-light railway signal can be made, and great fun can be had from a complete signalling system arranged on these lines. Road traffic control signals can be made in a similar manner. The coloured discs can be employed effectively also for the port and starboard lights of ships.

The lamps can be used in many working models, such as horizontal engines, etc., to illuminate the moving parts of the model, and a very striking effect is obtained when the model is set to work in a dark room and the lamps are lighted up. Lamp standards can be made for use on model railways or goods yards, and working model cranes can be fitted with flood-lights to light up the scene of operations. Other obvious uses for the lamps are in connection with such models as warehouses, railway stations, fairground models, motor buses and tramcars, etc.

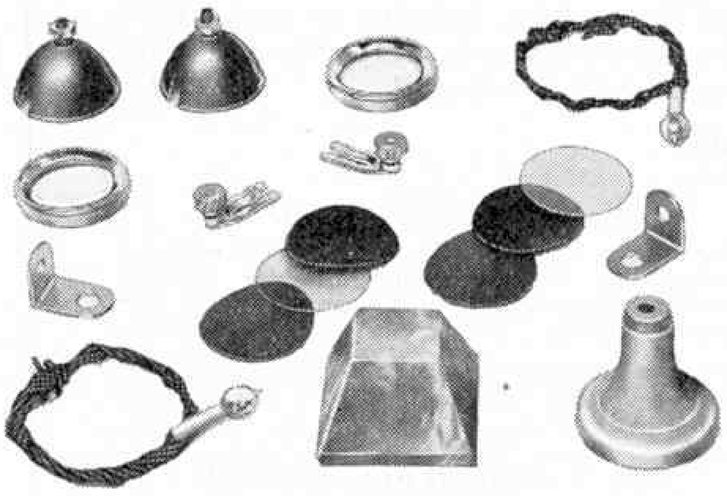


Fig. 2. The components of the Lighting Set.

A model watch stand provides a practical use for the Lighting Set, a lamp being arranged in such a manner that it shines on the face of the watch. Various novel uses for the pea lamps are indicated in the Manuals. For instance, in one case the lamps are used, separately, to represent the eyes of a model Spaniel; and elsewhere an ingenious representation of a blacksmith's fire is produced from opaque red paper under which a pea lamp is placed.

The applications of the table lamp will be understood from Fig 4. In this case the lamp is placed on a miniature bedside table, and when it is illuminated adds considerably to the attractiveness of the model.

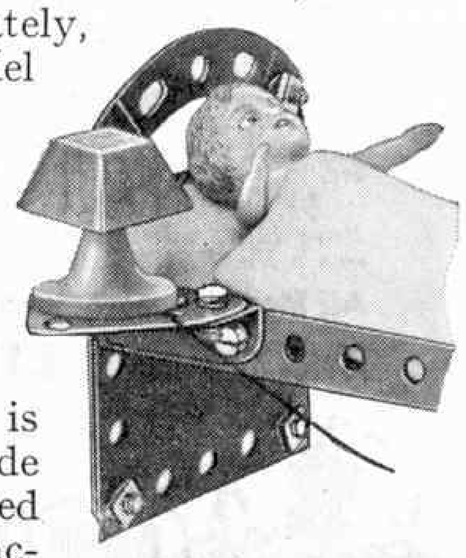


Fig. 4. Showing a use for the stand lamp.

"I'm building a Seaplane next!"

MECCANO AEROPLANE CONSTRUCTOR OUTFITS

Boys, Meccano Aeroplane Outfits are great! They enable you to build wonderful models of aeroplanes—the most realistic you ever saw.

The parts contained in these Outfits enable aeroplane construction to be carried out on sound engineering lines because they are all interchangeable on the famous Meccano principle. The illustrated Manual of Instructions included in each Outfit shows how to build high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting models. Buy a Meccano Aeroplane Outfit to-day!

Price List

Standard Series

No. O AEROPLANE OUTFIT

An interesting range of models can be built with this Outfit, including high and low wing monoplanes, seaplanes and standard light biplanes. All the parts are interchangeable. Price 5/–

No. O1P AEROPLANE HANGAR OUTFIT

This novel and attractive Outfit consists of the complete range of No. O Aeroplane Outfit parts packed in a No. O1 Aeroplane Hangar instead of in a carton. Price 9/6

Note. The parts in the No. O and No. O1P Aeroplane Outfits are smaller than those in the other Outfits in the series and are not intended for use with these Outfits.

No. 1 AEROPLANE OUTFIT

Magnificent models of high and low wing monoplanes, and interesting model biplanes representing standard types can be built with this fine Outfit. Price 9/–

Meccano Aeroplane Constructor Accessory Outfit No. 1a, costing 8/6, will convert a No. 1 Outfit into a No. 2.

No. 2 AEROPLANE OUTFIT

This Outfit enables a much wider range of models to be built, including triple-engined monoplanes and biplanes, and a racing seaplane of the type that was used in the Schneider Trophy Contests. Price 16/6

Special Series

No. 1 SPECIAL AEROPLANE OUTFIT

The parts in this Super Aeroplane Outfit will build over 20 realistic models of different types of aircraft. The range of special parts includes main planes fitted with ailerons, tail planes with elevators, movable rudder, radial engine cowling, etc. Price 15/–

A No. 1a Special Aeroplane Accessory Outfit, Price 11/6, will convert a No. 1 Special Outfit into a No. 2 Special.

No. 2 SPECIAL AEROPLANE OUTFIT

This is the finest and most attractive Aeroplane Constructor Outfit on the market. It contains a big range of aircraft parts, with which numerous models of practically any type of machine may be built—44 examples are shown in the Manual of Instructions. All the parts that are special features of the No. 1 Special Outfit are included also a number of other parts of special design. Price 25/–

All Meccano Aeroplane Outfits are available in three different colour combinations

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

No. O Aeroplane Constructor Outfit

No. 1 Special Aeroplane Outfit

No. 2 Special Aeroplane Outfit

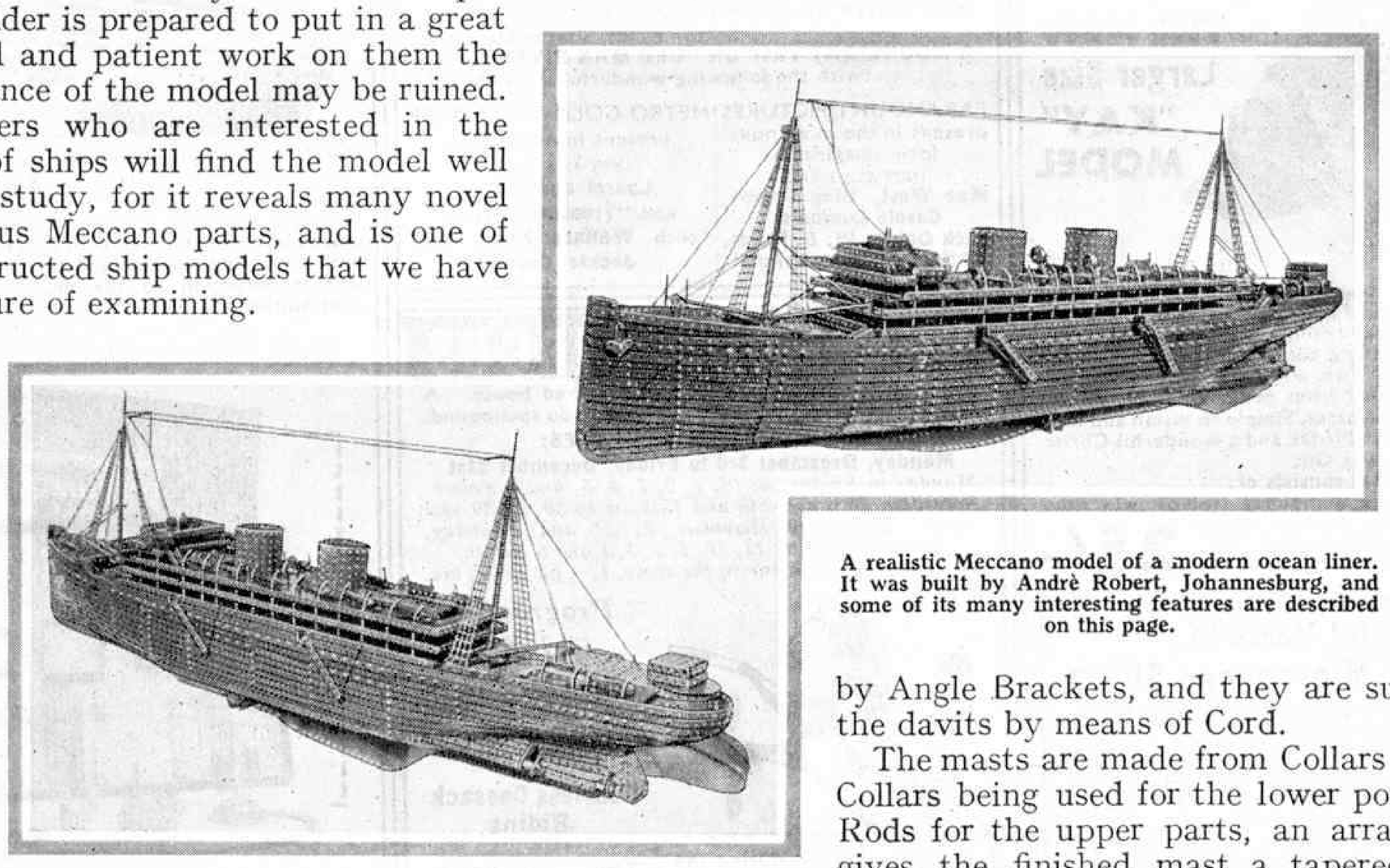
A Meccano Passenger Liner

South African Reader's Fine Model

MODEL-BUILDERS who are on the look-out for new ideas will find much to interest them in the fine model Meccano passenger liner illustrated on this page. It is constructed entirely from Meccano parts skilfully chosen and ingeniously combined, and is the work of a South African reader, Andrè Robert, Johannesburg, for whom it won one of the principal prizes in a recent "*M.M.*" model-building competition.

Probably the finest feature of the ship is the remarkably realistic manner in which the shaping of the hull is carried out, especially the stern and counter. These portions of a vessel are always difficult to reproduce, and unless the builder is prepared to put in a great deal of careful and patient work on them the whole appearance of the model may be ruined.

Model-builders who are interested in the construction of ships will find the model well worth careful study, for it reveals many novel uses for various Meccano parts, and is one of the best-constructed ship models that we have had the pleasure of examining.



A realistic Meccano model of a modern ocean liner. It was built by Andrè Robert, Johannesburg, and some of its many interesting features are described on this page.

The keel consists of Angle Girders and Strips, two $7\frac{1}{2}$" Strips being used for the bow post, to the lower ends of which are bolted $2\frac{1}{2}$" small radius Curved Strips that form the curved foot. The ribs are represented by further Strips bolted to the keel and bent so as to give the required contour to the hull. The longitudinal Strips forming the hull plating at the bows are fixed between the $7\frac{1}{2}$" Strips of the bow post and then bent outward and bolted to the ribs. Strips are used also for the stern and plating, and Angle Girders of various lengths bolted internally across the hull give rigidity and support to the decks and superstructure.

Another important item in the construction of the hull that is worthy of special mention is the designing and fixing of the propeller stern tubes. These were built up as separate units, and then placed in position in spaces provided at the stern and fixed in place by Flat Brackets and Angle Brackets. The tubes are fitted with propeller shafts and propellers, which are driven by an Electric Motor housed in the hull. The accommodation ladders down the side of the hull are rather too long, for it will be noticed that they extend below the water-line.

In our opinion the hull appears to be a trifle short when compared with the usual proportions of an actual vessel of this kind, but this defect might easily be remedied by making one or two minor alterations to the counter or overhanging portion of the stern.

The superstructure of the model is remarkably solid in construction. This is due to the judicious employment of Angle Girders, the equidistant holes of which give an excellent impression of portholes. Good use has been made also of a number of Healds, one end of each of which is bolted to the hull, while the centre hole is bolted to the Angle Girder that forms the promenade deck. The other end of the Heald is then passed through the Angle Girder and bent over to form an arm of a lifeboat davit. The portions of the Healds visible between the decks represent the stanchions that support the overhanging portion of the deck above. The life-boats are made of Strips connected by Angle Brackets, and they are suspended from the davits by means of Cord.

The masts are made from Collars and Rods, the Collars being used for the lower portions and the Rods for the upper parts, an arrangement that gives the finished mast a tapered appearance. It will be seen that the model is fitted with shrouds and ratlines, but this is not in keeping with modern practice. The masts of modern liners are made of tubular steel, and are sufficiently large to accommodate an internal spiral staircase, which obviates the necessity for external rigging and ratlines.

In building a model ship it is generally a difficult task to represent portholes satisfactorily owing to the difficulty of finding suitable Meccano parts that show up clearly against the holes in the Strips and Angle Girders of the hull. In this model Washers are used with good effect for the purpose, and they certainly appear to be in proportion to the general scale of the model.

Another difficulty that often arises is that of obtaining colour contrasts between the various sections of a model, but this can generally be overcome by the use of coloured and nickel plated parts. In the ocean liner described here the nickelled Washers used for the portholes provide a good contrast to the enamelled hull and show up splendidly. The propellers are Threaded Couplings fitted with three Flat Brackets, which are twisted to the required pitch.

BOYS! ALL THE BEST PRESENTS ARE AT

GAMAGES

NOW IN FULL SWING

CHRISTMAS BAZAAR

Britain's Biggest Display of Toys, Models, Games, etc.

A Real House Telephone Set for 25/-

THE NEW Larger Size "KAY" MODEL

Here are the chief features:—
Practically full size, the hand piece measuring 8¾" long, and the base 6¾" wide. Automatic calling on lifting the Receiver, giving a high-pitched "calling tone." Beautifully moulded and finished throughout. Two wires only connecting the two instruments. Operates from ordinary 4-volt pocket lamp batteries fitted in the bases. Simple to install and foolproof in working. BRITISH MADE and a wonderful Christmas Gift.

The set consists of:
two complete instruments, and thirty feet of twin wire. Batteries 4d. extra or the Special "Kay" Battery 6d. Extra lengths of Flex, 30 ft., 1/–, 60 ft., 2/–.

PRICE **25/-** per pair

Wonderful Value in Standard Size Microscope Slides

We are able to offer some exceptionally fine hand-made microscope slides comprising a vast range of highly interesting subjects. The subjects are all beautifully mounted, specially suitable for the beginner and each slide is clearly named. The following are examples of the subjects included:—

1. Section of a Spider.
2. Section of a Human Nerve.
3. Section of Human Artery.
4. Section of Butterfly Scales.
5. Section of Human Lung.
6. Section of Human Skin.

USUALLY 12/– PER DOZ. SPECIAL XMAS PRICE **7/6** PER DOZ. Post 4d. Per Doz.
9d. EACH. Post 2d.

In conjunction with and by kind permission of Messrs. Paramount Pictures and Messrs. Metro-Goldwyn-Mayer, Gamages present

"THE CHRISTMAS SHOWBOAT"

WAY DOWN ON THE MISSISSIPPI— Cotton Fields, Slavery Days, etc.
A MOONLIGHT TRIP ON "OLD MAN RIVER"— with the following wonderful show aboard:

PARAMOUNT PICTURES present in the most novel form imaginable (NOT AS A FILM) **Mae West, Bing Crosby, Carole Lombard, Jack Oakie, W. C. Fields, "Alice in Wonderland"**

METRO-GOLDWYN-MAYER present in novel form (NOT AS A FILM) **Laurel and Hardy,** and **"Treasure Island"** with **Wallace Beery and Jackie Cooper**

CHAPMAN'S CIRCUS

Every performance is playing to a packed house. A thrilling, rollicking show that will hold you spellbound.

TIMES OF PERFORMANCES:
Monday, December 3rd to Friday, December 21st
Monday to Friday, at 12, 1, 2, 3, 4, 5, and 6 o'clock. Saturday, December 8th and 15th, at 10-30, 11-30 and 12-30. Saturday, December 22nd, and Monday, December 24th, at 11, 12, 1, 2, 3, 4 and 5 o'clock.
Price of Admission during the above, 1/–, including tax.

Seats during the whole period can be reserved up to 90 minutes before the commencement of any performance, without extra charge.

Programme includes:

Wire Acts,
Trapeze Acts,
Fearless Cossack Riding
The Elephants in their own Musical Comedy
Evolution of the Six Royal Ponies,
Etc.

THE ADANA "BABY" PRINTING MACHINE

Here's a really practical and instructive gift. Although of "miniature" dimensions the Adana is a real printing machine. It is automatic and self-inking, and is supplied complete with real printers' metal type, ink, spacing and illustrated instructions. Don't forget, money can be made with a printing machine and this junior model is an excellent introduction to the money-making possibilities available.

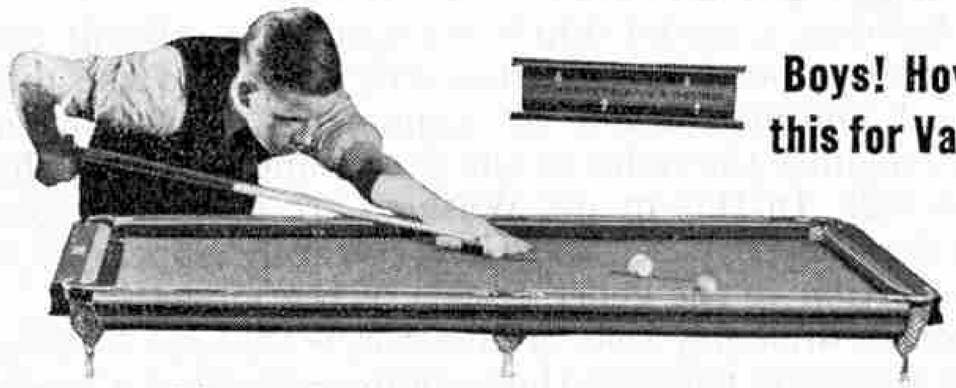
Price **10/6**

Larger Models are obtainable. Prices on application.

THE GAMAGE CHEMISTRY SET

This set contains 23 chemicals (of which 7 are contained in test tubes with rack, which may be removed from the box when working). Bunsen burner, filter funnel, filter papers, Florence flask, measuring scoop, large test tube, trays, glass tubing, and a booklet of instructions for carrying out experiments.

Price **5/-**



Boys! How's this for Value?

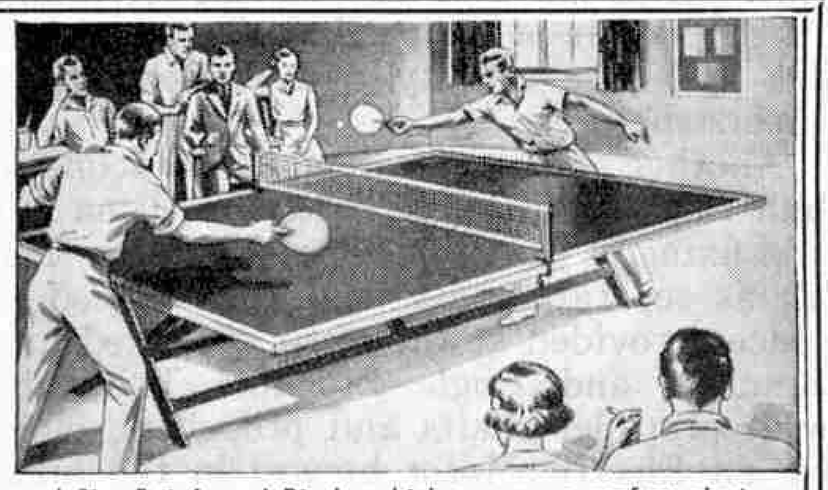
GAMAGES MINIATURE BILLIARD TABLE

Superior quality bed, battened to obviate warping. Cushion Rails of heavy continuous type, highly French-polished in either Mahogany or Oak finish. Cushions rubbered with moulded strip Para Rubber, imparting maximum resiliency and perfect accuracy. Hard wearing green cloth. Each table supplied with one set of turned (not moulded) Composition Billiard Balls, Two Cues, Four Feet for adjusting level, SUPERIOR MARKING BOARD, One Cube of Chalk and sheet of Billiard Rules.

Size of Table	Length of Cue	Diam. of Ball	
3 ft.	3 ft.	1⅛ in.	**19/6**
3 ft. 6 in.	3 ft.	1¼ in.	23/6
4 ft.	3 ft. 6 in.	1⅜ in.	35/–
5 ft.	4 ft.	1½ in.	55/–

Gamages lead the Table Tennis Boom

Amazing Value in TABLE TENNIS TOPS

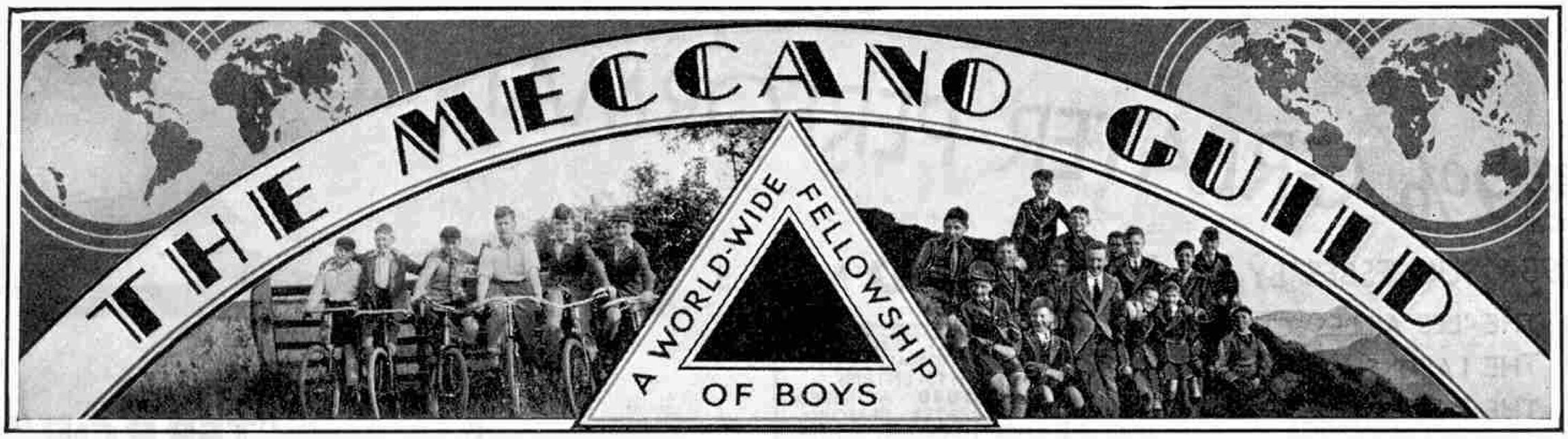


Constructed from selected ⅝in. Reinforced Birch, which ensures a perfect playing surface, **without "dead spots"** (not to be confused with the cheaper plywood table tops). The under battening is of 1½ in. X ⅞in. material, **entirely obviating warping. Conforms to all regulations of Tournament play, is finished in match colour green with Association ¾ in. white line.**

SIZE, 8' × 4' PRICE **25/-** | TRESTLES **16/6** | SIZE, 9' × 5' PRICE **30/-**

Carriage 2/6 extra on Top and Trestles together outside our extensive van delivery area

GAMAGES, HOLBORN, LONDON, E.C.1 *Telephone: Holborn 8484*



Christmas Greetings

A Merry Christmas to every member of the Guild and to the officials and members of Meccano clubs throughout the world! It is given to very few people to send out Christmas greetings so comprehensive as these. My wishes travel to New Zealand, Australia, China and Japan on the one hand, and to Canada, the United States, the West Indies and Central and South America on the other; and they reach as far north as Norway and Sweden, and in the opposite direction go to the southern point of Africa. In a week or so I shall begin to receive Christmas cards and greetings from members in all these countries, and my mail during December will be a magnificent demonstration of the world-wide character of the Meccano Guild.

Welcoming New Members

The Christmas and New Year season invariably brings with it new members, for many boys make their first acquaintance with Meccano at that time of the year, or have their interest in it stimulated by the acquisition of larger Outfits or new parts. I shall be very pleased to welcome all Meccano enthusiasts who send in their application forms, and I am sure that there will be equally friendly greetings for those who join Meccano clubs. A vigorous recruiting campaign at this time of the year always yields good results, whatever form it takes. Exhibitions and notices of club events in the local press or in the shop windows of Meccano dealers, or of others who are kindly disposed towards Meccano clubs, usually attract new members. Personal efforts often are more effective, however, and every Meccano boy who has already joined a club should do his best to persuade his friends to follow his example, and then should spare no effort to ensure a happy time for his recruits.

The best means of retaining the interest of old and new members alike during the second winter session, which commences next month, is to plan effective changes of programme. The New Year is an excellent time for the introduction of new hobbies or of novelties in the model-building programme. Perusal by a Leader of the booklet *"How to Run a Meccano Club"* probably will bring to light suggestions that he has not yet put into practice, and I shall be very pleased to send a copy of this booklet to club officials not already possessing one. The *"Club Notes"* pages of past issues of the *"Meccano Magazine"* also are useful in this respect, and the programme items found in these two sources have the advantage of being thoroughly practical, for they have been tried out in actual club work.

It is wise also to arrange variations in games and recreations. In regard to these, and indeed to all new items in the programme, plans should be made at once and announced to members as early as possible in order to give them opportunities of expressing their own ideas on the proposals, and of thinking out their own shares in the proceedings. A Christmas Social Evening gives an excellent opportunity for making an announcement of this kind and its atmosphere encourages friendly discussion that will reveal the attitudes of members to the new proposals.

Meccano Club Leaders

No. 77. Mr. S. R. Jones

Mr. S. R. Jones is Leader of the Macclesfield Grammar School M.C., which was affiliated in June of this year and has held a successful Exhibition at which a splendid model of the New Tyne Bridge was the chief attraction. This and other exhibits were highly appreciated by the visitors, who included the Bishop of Chester and the Mayor of Macclesfield.

The Fun of Competitions

Variety is as essential in model-building as in any other club activity, and for this reason "Simplicity" contests, time tests and similar easy but exciting competitions should be arranged. Interesting contests of this type are referred to in the reports of the proceedings of the Middlesbrough and Melbourne clubs that appear in this month's issue. A favourite pursuit at Middlesbrough is the well-known Kim's Game, in which the contestants are allowed a few minutes to examine a number of objects grouped together. These are then covered, and the winner is the one who is able to name the largest number correctly from memory. In Meccano club adaptations of this game an assortment of large and small Meccano parts forms a good test for members, who are always keen to score well.

In the Melbourne club great interest was taken in a recent contest in which members were asked to find how many 1" Strips had been employed in constructing a large model of Sydney Harbour Bridge. Each competitor was permitted five minutes and the necessity for keenness is shown by the fact that nobody was successful in finding all the four 1" Strips incorporated. Great excitement prevailed in the same club during a speed contest in which a truck on a Hornby Train layout had to be loaded and unloaded by means of an electrically driven model of a gantry crane. Fumbling on the part of any competitor led to serious loss of time, and the struggles to achieve haste without disaster were a source of great fun to the onlookers!

Contests such as these involve bodily activity as well as concentration. Members taking part in them have the pleasant feeling that they are "doing something" in competition with others, and have the added joy of being able to watch their rivals' efforts and to cheer their successes—or scoff at their blunders! No doubt similar events have been held in other clubs and I shall always be pleased to receive details of novel contests of all kinds.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested in becoming members should communicate with the promoters whose names and addresses are given below:

AUSTRALIA—D. Phillips, "Merrilea," Dubbo, N.S.W.
CHELMSFORD—I. Edmond, 7, Upper Roman Road.
CHESTER—Mr. J. S. Hayter, Blossoms Hotel.
FRASERBURGH—G. E. Smythe, c/o Mrs. Murray, Central Schoolhouse.
GRIMSBY—Mr. E. D. Cartwright, 36, Wellowgate.
LITTLE SUTTON—R. Collin, One Ash, Walkers Lane.
LIVERPOOL—W. Jackson, 67, Lark Lane, Sefton Park.
RUISLIP—S. Pashley, 52, Cornwall Road.
THORNTON HEATH—Mr. C. A. Sparkes, 5, Ingram Road.
THORPENESS—Master K. C. Brown, The Anchorage.
TURRIF—R. F. Gregor, Woodside, Delgaty.
WALLASEY—W. Cass, 49, Limekiln Lane, Poulton.

59% GREATER PERFORMANCE!

1934 SUCCESSES BY **WARNEFORD** MODELS

THE 'LES AILLES' CUP★
THE LADY SHELLEY CUP
THE PILCHER CUP
INTERNATIONAL—THE HAGUE

OCT. 1934
INTERNATIONAL EVENT WITH 134 ENTRIES
WARNEFORD ACHIEVED 59% GREATER PERFORMANCE THAN ANY OTHER COMPETITOR.

WARNEFORD MODELS AFFORD A SOUND TRAINING IN THE PRINCIPLES OF REAL FLYING—THE ADJUSTMENT AND CONTROL OF THESE MODELS BEING VERY SIMILAR TO THOSE OF THE REAL AIRPLANE. YOU CAN "LOOP" AND "ROLL" A WARNEFORD!

The "TERROR"
Price **5'6** Complete

FLIES 300 FT. AT 1,230 FT. PER MIN. CLIMBS TO 30 FT. AND HAS A GLIDE OF 1 IN 7. PRODUCED WITH THE CORRECT COLOURS AND MARKINGS OF A MILITARY FIGHTER.

OTHER MODELS 1'6 TO 5 GNS.

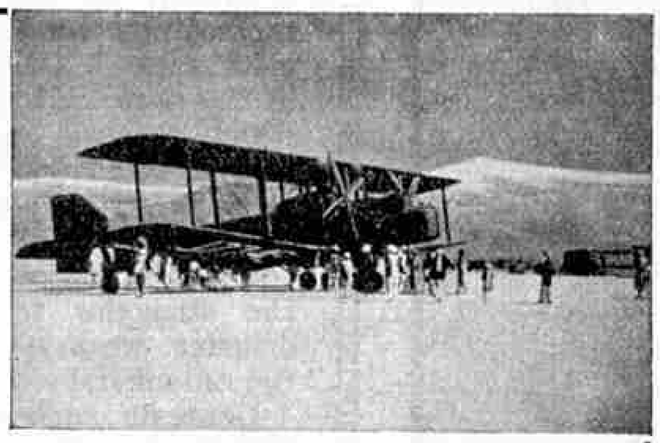
BE SURE OF A WARNEFORD FOR XMAS—
IT WILL BRING YOU HOURS OF JOY THROUGHOUT 1935

ILLUSTRATED PRICE LIST POST FREE ON APPLICATION FROM—

WARNEFORD FLYING AIRCRAFT (DEPT. E9), GREENWICH, LONDON, S.E.10

FROM ALL GOOD STORES
TOY SHOPS & SPORTS DEALERS
THROUGHOUT THE WORLD

F. WARNE & CO. LTD.



A HANDLEY PAGE BOMBER
Series D, No. 39. 100 Pieces, 2/-

Manufacturers of

THE "CHANDOS" JIG-SAW PUZZLES

Nearly 250 puzzles containing from 50 to 1,250 pieces and costing from 9d. to 30/-

Complete Catalogue on Application

GOOD CUTTING
GOOD WOOD
FIRST-CLASS SUBJECTS

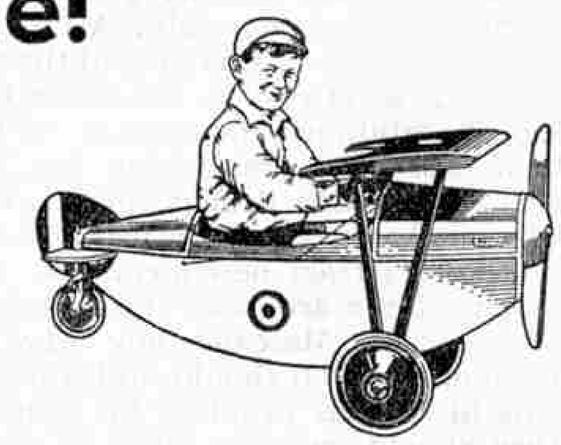
1-4, BEDFORD COURT, LONDON, W.C.2
and in New York

Boys—have your own plane!

Here's a fine Model Pedal Aeroplane—just like the real thing! Finished in realistic bright colours. Fitted with rubber pedals. Steering bar controls rear wheel and rudder. Enables you to do splendid stunts.

Minor-Plane (suitable for children up to 6 years) **42'-**

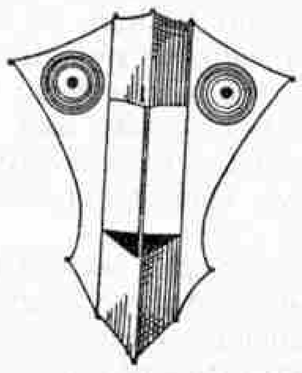
Major-Plane (suitable for children 6—10 years) ... ... **56'6**



Packing and carriage free to nearest station.

GIANT AERO-KITE

that flies 500 ft. high and loops the loop!



Designed on scientific lines the same as those used for target practice by H.M. Services. Aeroplane fabric reinforced with strengthening tape. Very strong. No tailings make it easy to fly.

4 feet high, price ... ... **8'6**
Packing and carriage free.

AERO-TOYS 27, Albion Rd., Greet Birmingham

Claremont Avenue School (Kenton) M.C.—The programme followed includes the construction of large models—the first to be undertaken being a representation of the Cunard-White Star Liner "*Queen Mary*"—Cinematograph Shows, Photographic work and Lectures. Operations on an extensive Hornby Train layout are being carried out and Table Tennis and other games are organised regularly. Club roll: 16. *Secretary:* S. J. Biggs, 20, Cranleigh Gardens, Kenton, Harrow.

Plymouth M.C.—Excellent work continues to be done by members, particularly on Model-building Evenings, the subjects of recent competitions including "*Ships*" and "*Army and Navy Equipment.*" High marks were awarded to several of the models shown. The club ramble to Yelverton was very successful, members enjoying cricket and races. A Tramway Modelling Section has been formed, and members are showing enthusiasm and diligence, several excellent model tramcars having been produced. Interest in tramcars is strong, special notes on the Plymouth system and rolling stock being contributed regularly to "*The Gear Box*," the club's magazine. Club roll: 70. *Secretary:* P. C. Frizzell, 85, Beacon Park Road, Swilly.

Sid Vale M.C.—The Annual Exhibition was held in a local school room and was remarkably successful. A splendid array of models built by members was on view, and particular interest was taken in a Fair-ground model built by the secretary, a Meccano Game, and models of a Paddle Steamer and a Double Deck Omnibus kindly contributed by members of the Exeter M.C. The room was well decorated with streamers and posters, and the stalls were illuminated by fairy lights kindly lent by Mr. Eveleigh, who also supplied music. Small silver cups will be awarded as prizes in Model-building Competitions held during the winter sessions now in progress, and good times are anticipated. Club roll: 25. *Secretary:* R. Gliddon, Sheffield House, Sidmouth.

Bexleyheath Boys' Central School M.C.—The last of the summer excursions took the form of a visit to Chatham during Navy Week, when an enjoyable day was spent in the Dockyard. A fountain pen was presented to D. Choppen, the retiring secretary. A model training plane has been placed in the club room and is available for practice by members on club nights. Regular model-building meetings have been resumed and many new members have been welcomed. Club roll: 21. *Secretary:* F. Grout, 57, Nursery Avenue, Bexleyheath, Kent.

Gate House School M.C.—Preparations are now being made for the Exhibition at the end of the term. The principal feature of this will be a country scene of to-day and a glimpse of the future, both expressed in Meccano models. The scene of the future will include buildings with landing places for aeroplanes on their roofs, aeroplanes, streamlined cars and many other novel vehicles. *Secretary:* F. Melville, The Gate House, Ingatestone, Essex.

Middlesbrough M.C.—Attractive meetings arranged for the present session include Games Nights, and Paper Nights at which members write short papers on various subjects of interest, in addition to Model-building Evenings. Recent models have included a Police Motor Van, a Breakdown Lorry, a Refuse Collector and a streamlined Racing Car. "Simplicity" models also have been built in a Special Contest. Those showed included a Surgical Operating Table, a Rope Ladder and an Electric Torch. After the entries in this contest had been judged, Kim's Game was played with Meccano parts. Club roll: 44. *Secretary:* L. Shepherd, 29, High Street, North Ormesby, Middlesbrough.

Hornsea M.C.—Excellent meetings have included Model-building Evenings, at which several types of ships and aeroplanes have been constructed, an Evening with a Microscope, Lantern Lectures and a talk on "*Television.*" Good use continues to be made of cinematograph films and football is played regularly. Games meetings also are arranged. The club is divided into three sections called "Engineers," "Scientists" and "Apprentices" respectively, and recently held its 300th Meeting. *Secretary:* L. Chapman, "Cleveleys," Hull Road, Hornsea.

Regent Street Central School (Heywood) M.C.—During the present session membership has reached 120 and great enthusiasm prevails. Members were actively engaged in model-building in preparation for the club's Exhibition and Concert. Other meetings have been devoted to Lantern Lectures, including one on "*The America's Cup*," by Mr. G. N. Chaplin, Leader, and Games Evenings have included a great Draughts Match between members of the club and the rest of the school. Other attractions arranged include a visit to the Meccano Factory and Table Tennis and Hand Ball Matches and members are keen to create new records in every club activity. Club roll: 120. *Secretary:* W. Jones, 123, Lynden Lea, Bury Street, Heywood.

St. Giles Cathedral (Edinburgh) M.C.—Club work is now in full swing and there is keen competition in model-building and railway working between the members of the sections that have been organised. The programme includes games, such as Table Tennis and Net Ball, that have proved favourites with members, and it is hoped that football matches will be arranged. A novelty is the introduction of Cinematograph Shows to be given fortnightly by two members of the club. Club roll: 146. *Secretary:* H. W. Govan, 25, South Orchard Road, Edinburgh 4.

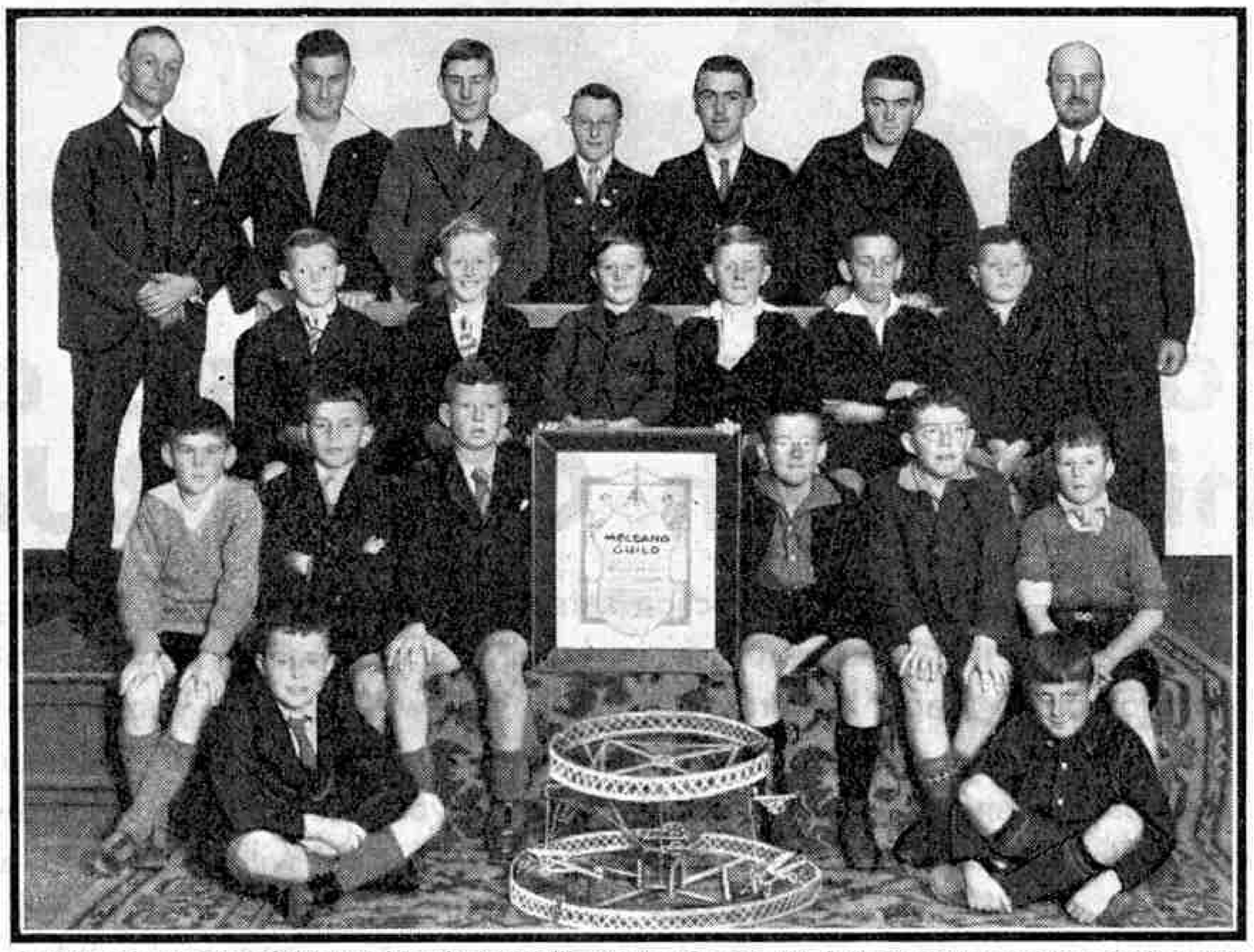
AUSTRALIA

Melbourne M.C.—Interesting models were entered in a competition for representations of household articles. Fretwork Competitions also have been held and members are particularly interested in models for use on miniature railways. In other novel contests prizes were awarded to members who loaded and unloaded a truck by means of an electrically driven model of a gantry crane in the shortest time, and to those who discovered most 1 in. Strips in a Meccano model of the Sydney Harbour Bridge. The bridge built for the second of these contests was 6 ft. long and there were four 1 in. Strips in it, but no member discovered all these in the five minutes allowed! Club roll: 12. *Leader:* Mr. L. Ison, 8, Hayes Street, Northcote, N.16, Victoria.

CANADA

Toronto Central Y.M.C.A. M.C.—Affiliation has been secured and members are very enthusiastic. Three prizes were gained by members at the Broadview Boys' Fair and the club was awarded a special prize for the best exhibit by a Toronto Meccano club. A display of models and other work by members has been arranged for an Open Night to which parents will be invited. New members are required and the President and secretary will be pleased to give details to boys who are interested. Club roll: 12. *Secretary:* W.B. Moore, 141, Albertus Avenue, Toronto, 12, Canada.

Winnipeg Y.M.C.A. M.C.—Affiliation was secured in readiness for the meetings of the present winter sessions. The club has a fine record, and the model-building skill developed by members was well displayed in a Railway Breakdown Crane, a Motor Car, a working Motor Chassis and other models displayed at a great Model Fair held in Winnipeg, when the Motor Chassis model was awarded a Certificate of Merit. Club work has included the design of speedometers and other devices for testing the powers of Meccano Clockwork and Electric Motors. Club roll: 7. *Secretary:* J. B. Cesak, East Kildonan P.O., Winnipeg, Canada.



A group of members of the Boys' Institute (Wellington) M.C. with Mr. J. E. Barnsley, Leader, who is at the left of the back row. The club was affiliated in July, 1931. Meetings are held in a well-equipped room and a special feature of the programme has been travel talks and lectures by members and others interested in the club.

ITALY

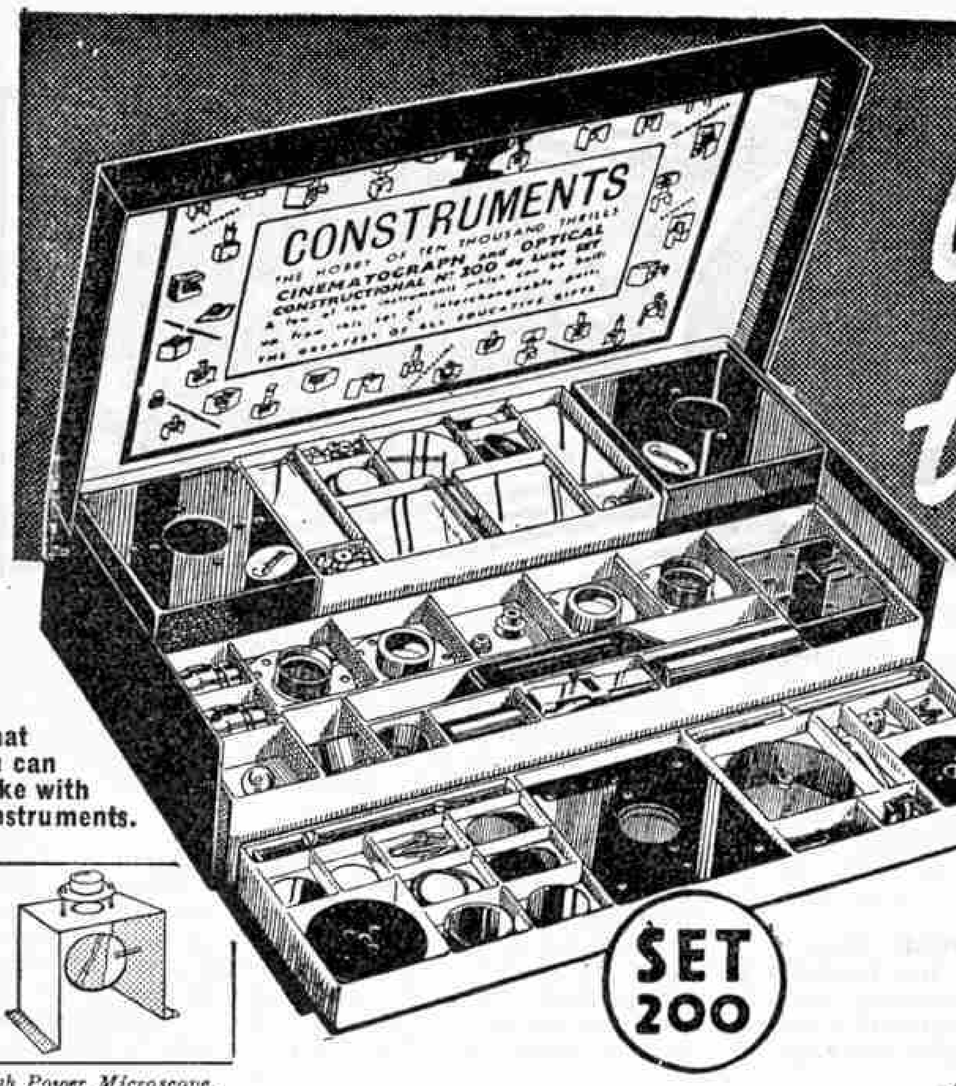
Milan M.C.—An enjoyable outing to Lake Como was arranged and visits to engineering works and other industrial establishments also have taken place. Members were specially interested in a film dealing with work in a steel foundry that was exhibited in Milan. Outdoor activities also have included a Baseball Match against a local team, and the Meccano club representatives were comfortable winners. Club roll: 14. *Secretary:* E. Vigo, Corso Genova 19, Milan, Italy.

NEW ZEALAND

Christchurch M.C.—Enjoyable meetings continue to be held regularly. Those held indoors are devoted to track operations on the Hornby layout and to "Simplicity Contests" and other competitions, in addition to games. Several models were entered in contests in the Christchurch Winter Show, one member securing a prize. A specially interesting talk on his visit to the Meccano Factory in Liverpool was given by Lieut. Brunskill. Visits have been paid to the Kaiapoi Woollen Mills, the Addington Railway Workshops and other places of interest. Club roll: 26. *Secretary:* L. W. Best, 28, Circuit Street, Merivale, Christchurch, New Zealand.

SOUTH AFRICA

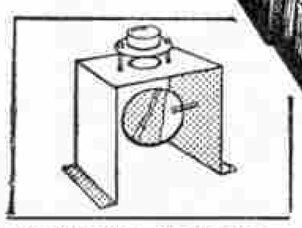
Diocesan College M.C.—Good attendances are recorded at meetings and excellent models are being built. The construction of the club's Hornby Train layout has been commenced, and a special switchboard has been installed to enable members to control their electric motors easily and conveniently. The secretary of the club unfortunately suffered a broken collarbone shortly after returning from a trip to England, R. E. Smith kindly taking over his work during his absence. Club roll: 14. *Secretary:* P. K. Wiener, Balcairn, Eden Road, Claremont, South Africa.

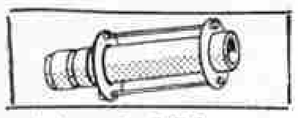


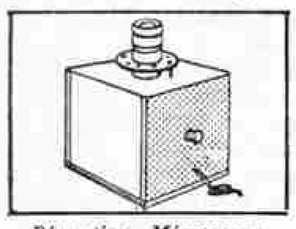
Boys! Here's a thrilling Hobby.

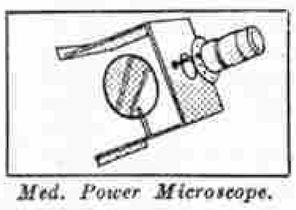
Professor Low writes:
"I advise all parents to see that their boys and girls are provided with a Set of Construments."

What you can make with Construments.

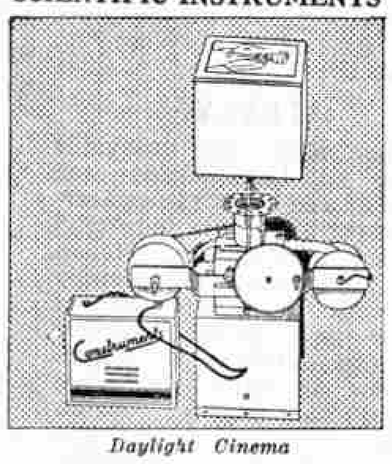

High Power Microscope.

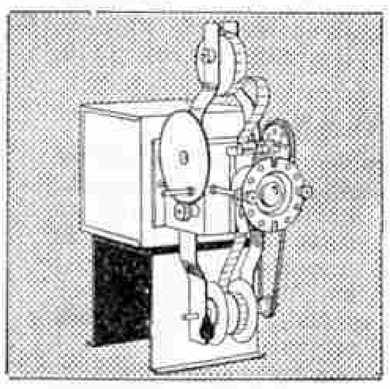

Astronomical Telescope.

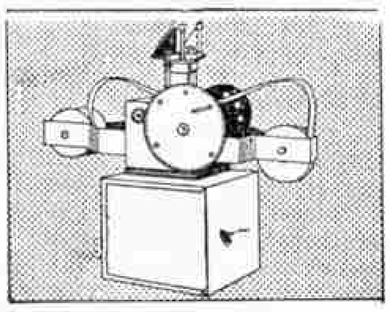

Dissection Microscope.


Med. Power Microscope.

AND LOTS OF OTHER SCIENTIFIC INSTRUMENTS


Daylight Cinema


Direct Cine Projector


Reversed Daylight Projector

You can make scores of exciting things with CONSTRUMENTS

These are the jolliest construction sets. You can make almost anything with them. Real things, too, that you can use in hundreds of thrilling ways. Cameras, Telescopes, Microscopes, Magic Lanterns, Kaleidoscopes—we can't tell you all the wonderful things, but look at the pictures. Just think of the absorbing interest of looking through a real microscope and all the wonderful knowledge you will gain. Then with the Magic Lantern—what jolly evenings. Show this to Mum or Dad—they will be as keen as you are on you having one of these splendid sets. You can start with the lowest priced set and by means of "plus outfits" work up to the larger sizes. The 200 is the "de luxe" model from which the full range of scientific instruments can be built, **and in addition three efficient Home Cinemas to take either 9.5 m/m or 16 m/m non-inflammable films. WRITE FOR AN ILLUSTRATED LEAFLET.**

Prices of Sets:

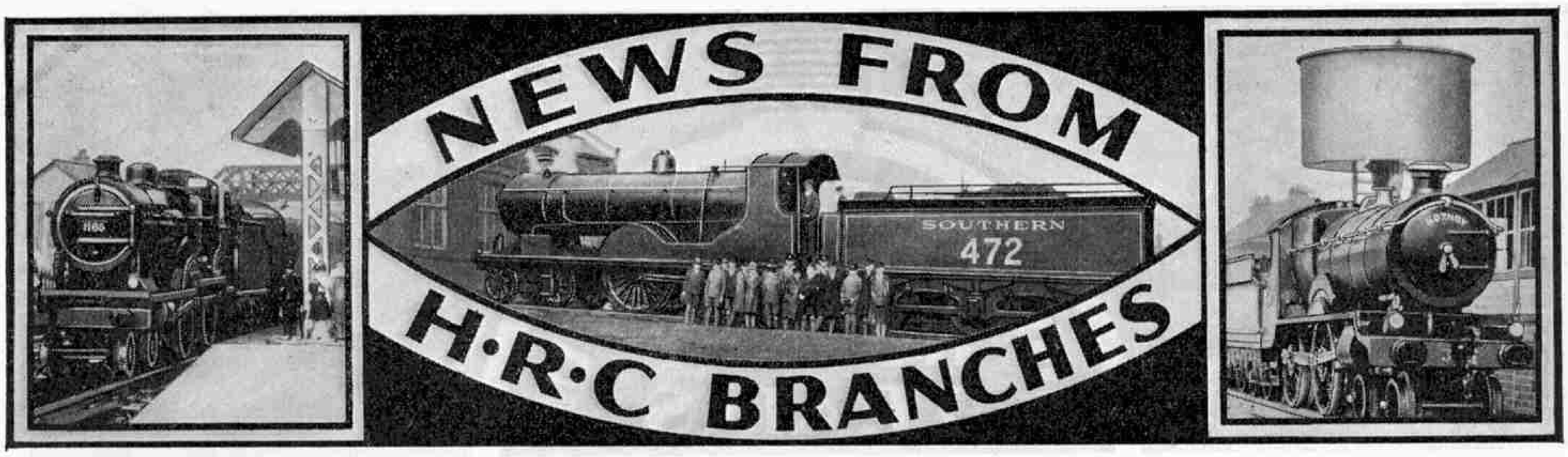
10 Set	20 Set	100 Set	200 Set
10/-	**18/6**	**37/6**	**47/6**

CONSTRUMENTS

Obtainable at any Toy or Departmental Store. If any difficulty, apply to the Sole Concessionaires:

L. REES & CO. LTD. (Dept. M.M.), 12, NEW UNION STREET, LONDON, E.C. 2

royds.



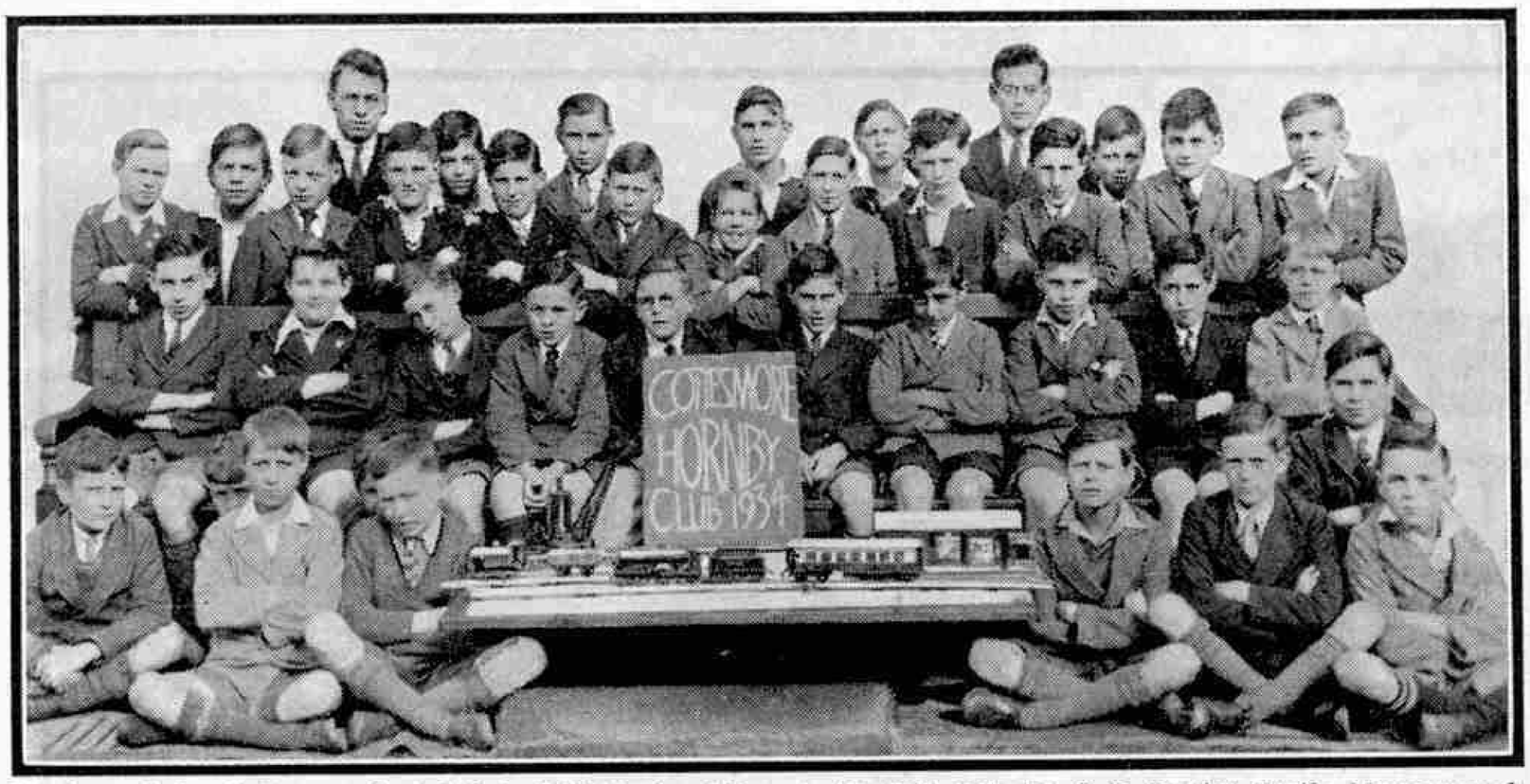
Branch News

SHEFFIELD.—Outdoor work was continued as long as possible and the Model Yachting Section held a very successful Regatta. The Branch railway has been relaid for the winter session and the first meetings were devoted to the addition of accessories. The track is double almost throughout, with two termini and a goods depot in which miniature freights are kept in readiness for goods working. Locomotive and carriage sidings have now been installed and frequent services of passenger expresses, local trains and goods trains are run. Excellent use is being made of Dinky Toy Motor Cars and Lorries, and there is heavy traffic in both directions at the level crossings. Secretary: W. B. Hutchinson, 35, Linden Avenue, Sheffield, 8.

DAGENHAM.—A presentation was made to S. Pashley, who was secretary from the formation of the Branch and is now removing to another district. The outdoor season ended with an enjoyable Cycle Run to Southend and the Annual Seaside Outing. Work is now in full swing and track operations are supplemented by excellent Games Meetings. An Exhibition has been held and two performances were given of a Concert, one in the afternoon for children and the other in the evening for parents and friends of members. Secretary: P. Bush, 121, Church Elm Lane, Dagenham.

WIMBORNE GRAMMAR SCHOOL.—Many new members joined at the beginning of the winter session and two sections were formed in order to avoid overcrowding. Colour-light signalling has been installed on the layout. This was officially opened at a special meeting, and members soon became accustomed to the new system, the working of which is giving general satisfaction. Special mid-week dinner hour meetings have been arranged for the benefit of day boys and train operations at an Exhibition aroused great interest among the many visitors. Secretary: R. B. Jenkins, Wimborne Grammar School, Wimborne, Dorset.

COTTESMORE CENTRAL SCHOOL.—Track meetings are now in full swing. The Branch railway covers the benches in a room 30 ft. square and a new layout is arranged monthly. Mr. Bowler, a member of the School staff, acts as Traffic Manager and members are given definite appointments as superintendents, station masters, drivers, signalmen, etc., every month. A special Lantern Lecture on a railway subject also is arranged monthly, and members are remarkably keen and enthusiastic. Secretary: J. S. Butler, Cottesmore Central School, Lenton, Nottingham.



Members of the Cottesmore Central School (Nottingham) Branch, No. 263, with Mr. S. D. Bowler, Traffic Manager, and Mr. J. S. Butler, secretary, who are on the left and right respectively of the back row. The Branch was incorporated in February of this year, and an excellent feature of the programme is a weekly meeting at which layouts designed by members are tried out in actual passenger and goods train operation.

LORDSHIP LANE (LONDON, N.22).—A successful Exhibition and Concert brought in a sum of about £2, and this has been spent on extensions of the track and on the material required to give it a firm foundation. A further visit has been paid to King's Cross Locomotive Sheds. The Branch track has been photographed. Secretary: R. L. Carrington, 49, Russell Avenue, Noel Park, Wood Green, London, N.22.

AUSTRALIA

MELBOURNE.—Splendid practice in train operations has been obtained in a series of meetings in which the Leader's Hornby Electric Railway was used. Each member was allotted a definite position in accordance with real railway practice and trains were run to a schedule. Operations of this kind are to be continued and members will be allotted various positions in order to familiarise themselves with every branch of model railway working. In an interesting Contest members were allowed to examine the railway layout for ten minutes and then prepared lists of alterations carried out since the previous meeting. A Speed Competition was organised in two sections, in which a coal train and a passenger express train respectively were hauled by the locomotives under test. A joint visit with the Carnegie M.C. was paid to the Train Control Rooms of the Victorian Railways, and members compared the system in use to that employed on the Leader's Hornby Electric Railway. Chairman: Mr. L. Ison, 8, Hayes Street, Northcote, N.16, Victoria, Australia.

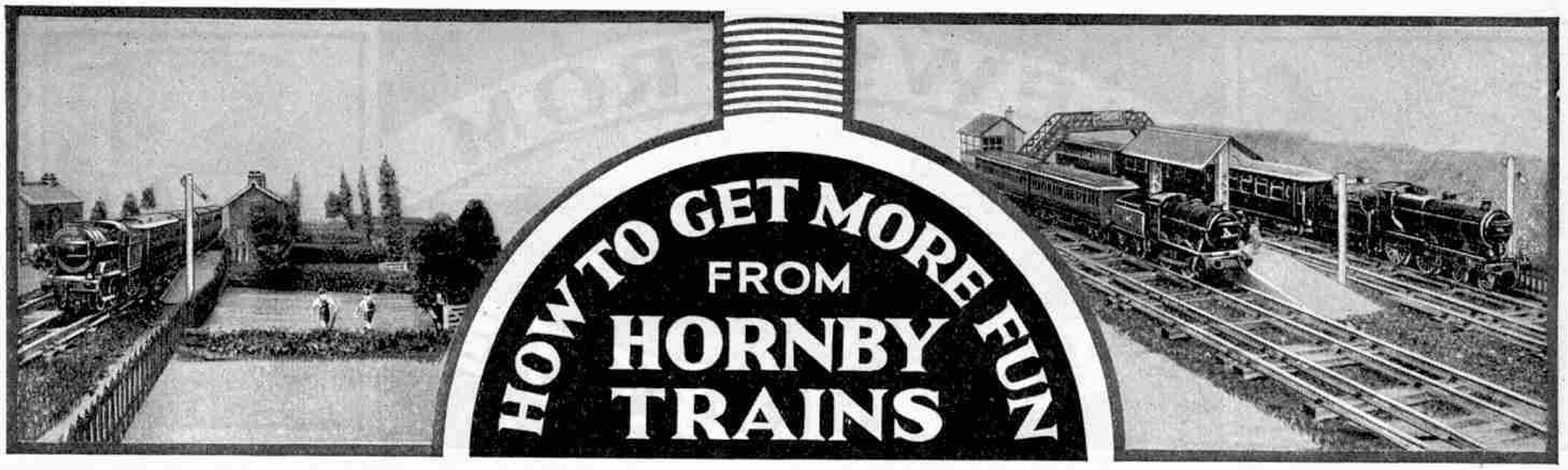
Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby Trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who apply.

CARDIFF—H. Thomas, 4, Dorchester Avenue, Penylan.
DUNFERMLINE—T. E. Masterton, "Benarty," 3, Ross Street.
GERMANY—H. Bräutigam, Zollpostlagernd, Düsseldorf 2, Germany.
RUISLIP—S. Pashley, 52, Cornwall Road.
WALLASEY—Miss E. B. Berrie, 12, Knowsley Road.
WEMBLEY—R. Yates, 28, Langham Gardens, N. Wembley.

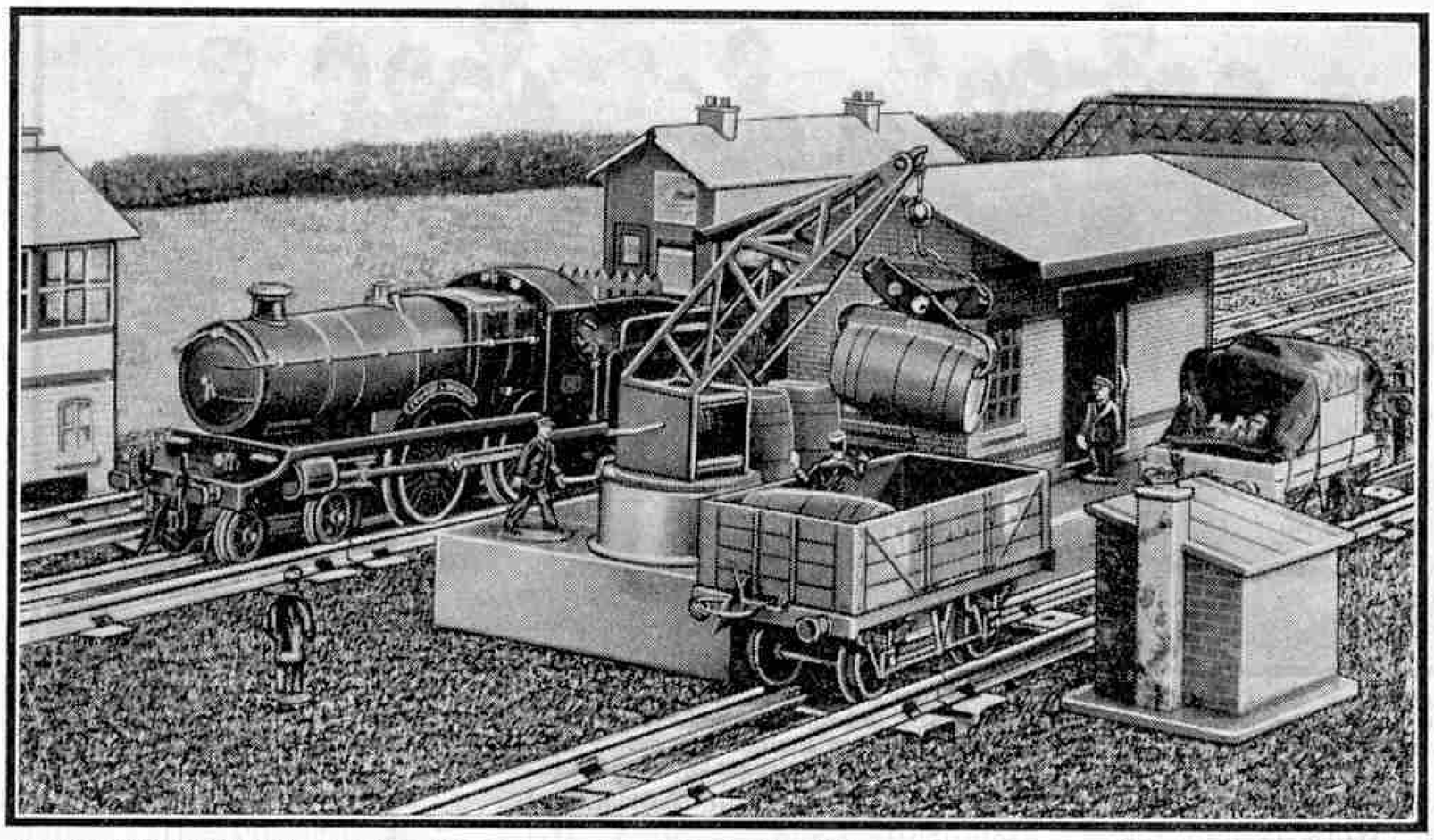
Branches Recently Incorporated

273. NEW SOUTHGATE—A. R. Wardle, 25, Limes Avenue, New Southgate, London, N.11.
274. MILAN—E. Vigo, Corso Genova N.19, Milan, Italy.
275. GLENGORSE—A. C. Forsyth, Glengorse, Telham Court, Battle.
276. WARDEN HOUSE—H. M. Anderson, Warden House School, Upper Deal.
277. TERRINGTON HALL (YORK)—J. M. Hutchinson, Terrington Hall, York.



LXXIII.—MIXED TRAFFIC ON HORNBY RAILWAYS

THE traffic carried by railways may be divided broadly into two main classes—passenger and goods. We have dealt frequently with the operation of both kinds on Hornby railways, but in a general sense and with particular reference to the characteristics of certain services. Freight services in miniature formed the subject of these pages in the "*M.M.*" last September, when a general consideration was given to almost all kinds of goods traffic. This month we intend to deal with some further suggestions that we think will interest readers. Some of them will be more or less novelties made possible by recent additions to the Hornby Series or to the range of Meccano Dinky Toys. Certain items might be conveyed by goods or passenger trains according to circumstances, or if the amount of traffic justified the step, they might be forwarded by a special train run for their conveyance alone as is often done in actual practice.



Loading miniature barrels by means of the Meccano Crane Grab. This fitting can be used for handling a variety of different loads in the goods yard of a Hornby railway.

A most useful piece of rolling stock recently added to the Hornby Series is the Flat Truck. Its design is based on the common type of low-sided wagon that is employed for such a wide variety of duties in actual practice. It conforms to the usual standards of the Hornby Rolling Stock, and is available lettered to represent each of the four group companies. It can be obtained loaded with an attractive miniature Cable Drum as used for transport of electric cables, or separately. The wagon is provided with four rings attached to its sides for securing various loads while in transit. Numerous other loads will no doubt suggest themselves to the keen miniature railway owner, especially in connection with the various Miniature Dinky Toys.

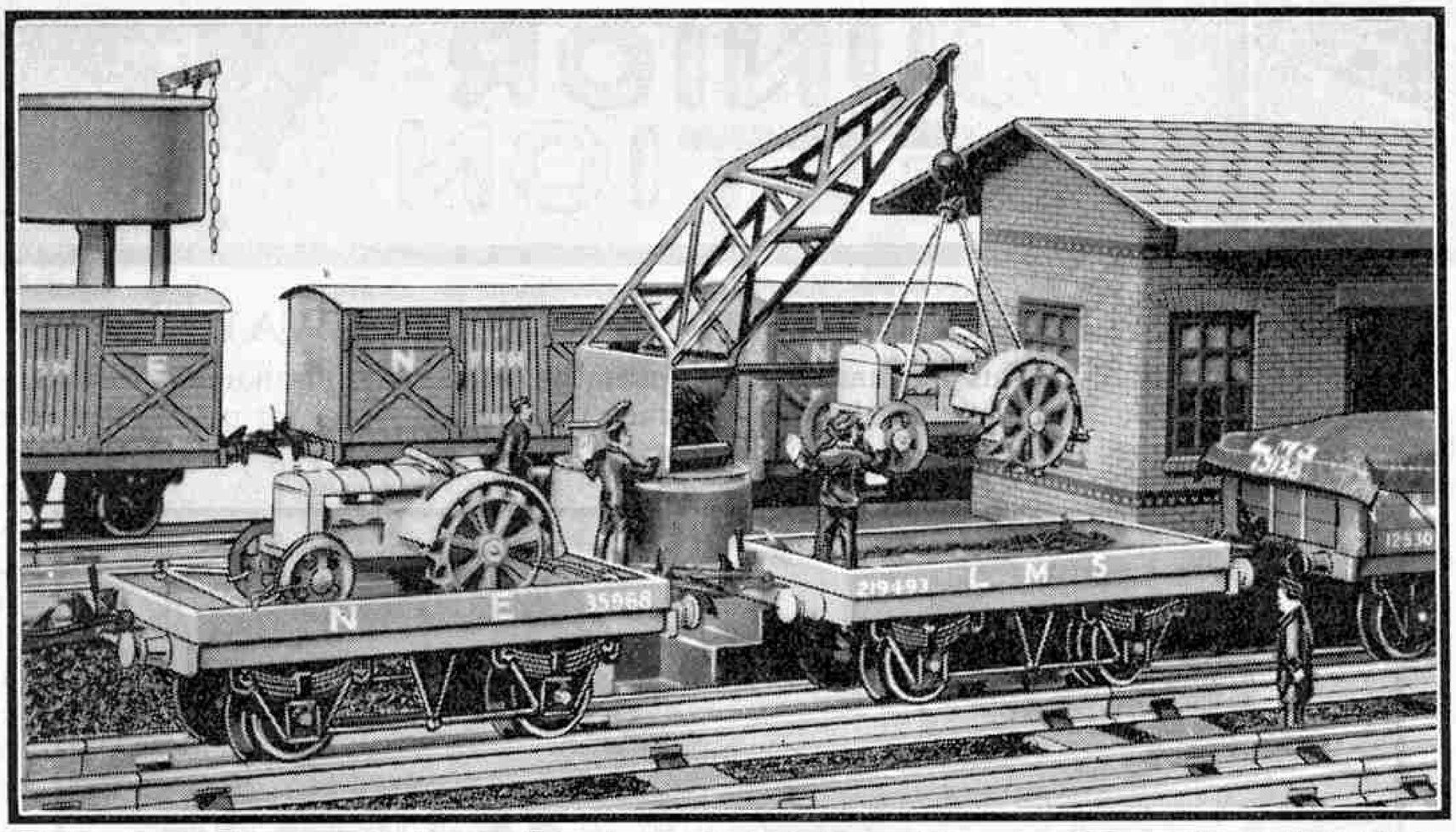
In the upper photograph on the next page is an interesting instance of the use of Flat Trucks for the conveyance of miniature Tractors (Dinky Toys 22e). One of these Tractors is shown being slung by the Goods Platform crane, and another is securely bound for transport to the rings of the Flat Truck by means of "ropes" of Meccano Cord. Some very fascinating loading and unloading operations can be carried out on these lines, not only with suitable Dinky Toys but with other items. The correct trussing of vehicles, such as Tractors or the various Motor Vehicles, is an interesting subject that calls for nimble fingers in order to obtain the correct effect. When loading of such items as these has been carried out, some ingenuity will be required in order to sheet the loads over neatly and effectively by means of the Hornby Wagon Tarpaulins. The realism thus obtained, however, well repays the amount of patience required to carry out these operations.

Certain loads may require a special arrangement of tackle to enable them to be hoisted properly. In the handling of the Tractor illustrated, a special sling was made of Meccano Cord, to suspend the front end of the Tractor by means of "ropes" attached inside the wheels to the front axle; the rear end is supported on a "lifting bar" passing across under the "splashers" behind the driving wheels. Two other ropes are attached to this bar—a match stick actually!—and connect with the forward ropes at the crane hook. Where the hoisting of Tractors is a regular procedure on the line, it will be worth while to make a permanent sling specially for the job. Small wire hooks to grip the front axle will save much time, and the ropes and bar should be adjusted to give an even position for the Tractor when slung. The devising and making of special tackle of this kind will be found quite an interesting part of the work of the system, apart from the actual operation.

For certain items good use may be made of the Crane Grabs of the Meccano System (Part No. 150). These have

a "scissors" action, which enables them to grip securely any suitable load that can be accommodated between the jaws. Their use is shown in the photograph on the previous page, where they are employed for hoisting barrels as used on the Barrel Wagon. They may be used equally well with Meccano Loaded Sacks (Part No. 122) or with any other similar items that may require to be handled by the Goods Platform crane.

The items mentioned so far include only a few of the extraordinary collection of miscellaneous items that are entrusted to railway transport. The Hornby Cattle Wagon has always been a popular piece of miniature rolling stock, and since the introduction of the Farmyard Animals (Dinky Toys Set No. 2) and the Shepherd Set (Dinky Toys Set No. 6), there has been ample reason for its use on Hornby railways. The conveyance of livestock is an important traffic, and the reproduction of this in miniature is another interesting phase of model railway working. Ordinary cattle travelling in large numbers are usually driven along the roads to and from the railway depots where they are loaded and unloaded. On the other hand, special animals proceeding to shows or markets are usually conveyed over the road portion of their journey in a special vehicle adapted for the purpose. Special road livestock "floats" are employed extensively by the railway companies for this portion of their traffic, and the reproduction of this practice in miniature is therefore suggested.

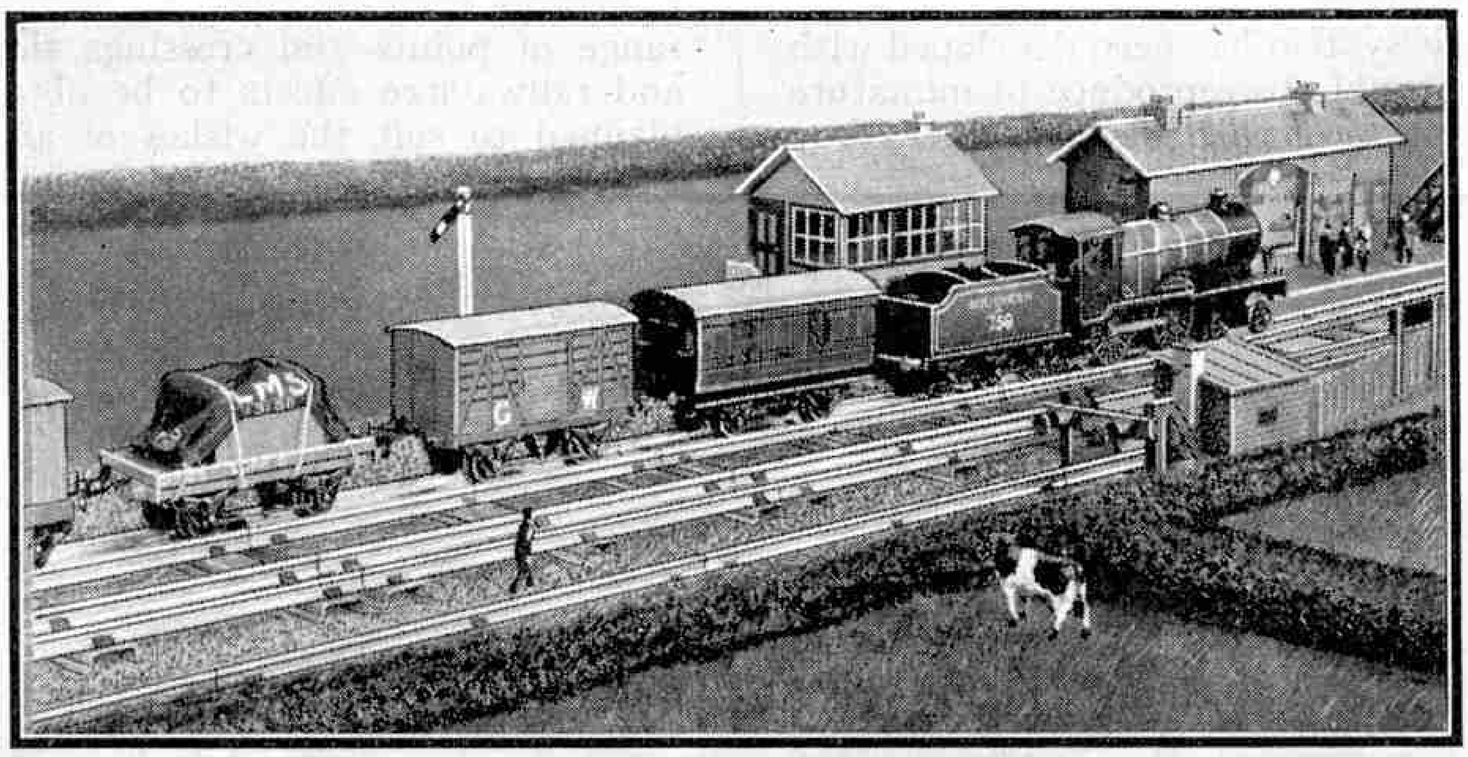


Miniature Tractors (Meccano Dinky Toys No. 22e) make very effective loads, especially in connection with the new Flat Truck. In this illustration is shown a method of loading them by means of a special "sling."

For Hornby railway service good use may be made of the Market Gardener's Van (Dinky Toy No. 25F) for this purpose. This vehicle reproduces the open "post and rail" construction employed for such vans, and is very similar to an open livestock float. In actual practice a rope net is often placed, as a safety measure, over the top of a float conveying stock, in case any of the latter prove restive and attempt to climb or leap out of the vehicle. A suitable net may be made of lengths of Meccano Cord passing along and across the top of the Van, the lengths being knotted together where they cross.

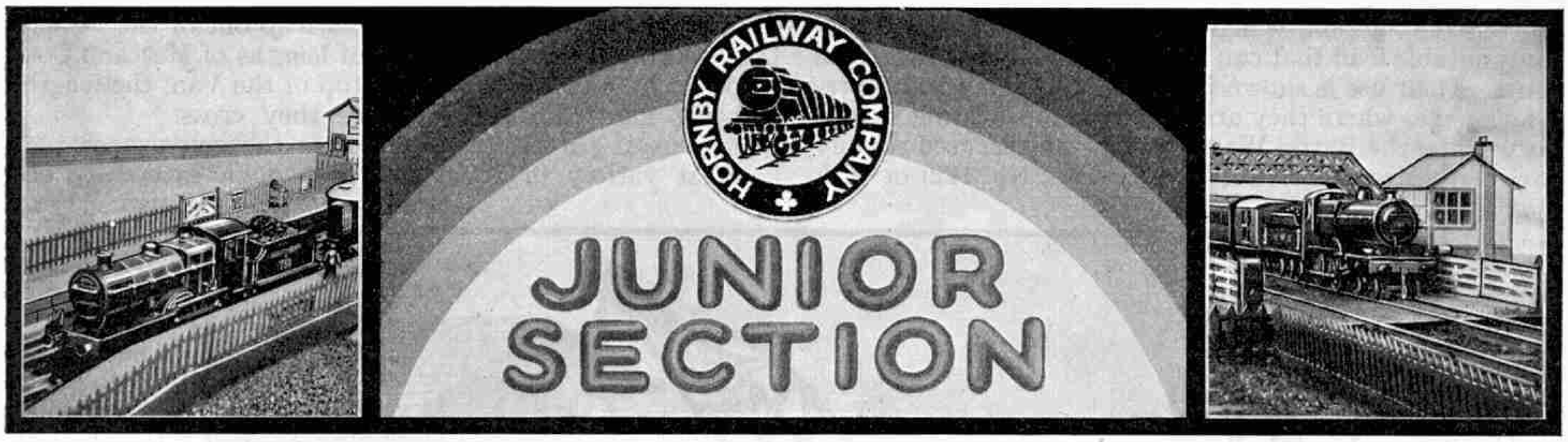
General parcels traffic involves the conveyance of a great variety of articles, even though externally one parcel, except for size, looks very much like another. This is to the advantage of those Hornby railway owners who make a feature of parcels traffic on their lines, and who make up suitable miniature parcels, perhaps by folding up small pieces of thin brown paper and tying them up with cotton. Such small additions as this make the station platform or goods loading bank more realistic, and it is quite entertaining to load these miniature consignments into vans and transport them in the correct manner.

The regularity of the appearance of the daily newspaper is largely dependent on efficient railway service. This suggests yet another kind of train to be operated on a Hornby railway; and a small fleet of Dinky Toy motor vans may be used in conjunction with the train service in order to complete in miniature the distribution of newspapers. Those who are interested may exercise their ingenuity and patience in making up little bundles to represent bales of newspapers duly bound up for conveyance by train. There is a special appeal about parcels and newspaper trains, for they are essentially night services that rarely come to the notice of the average traveller.



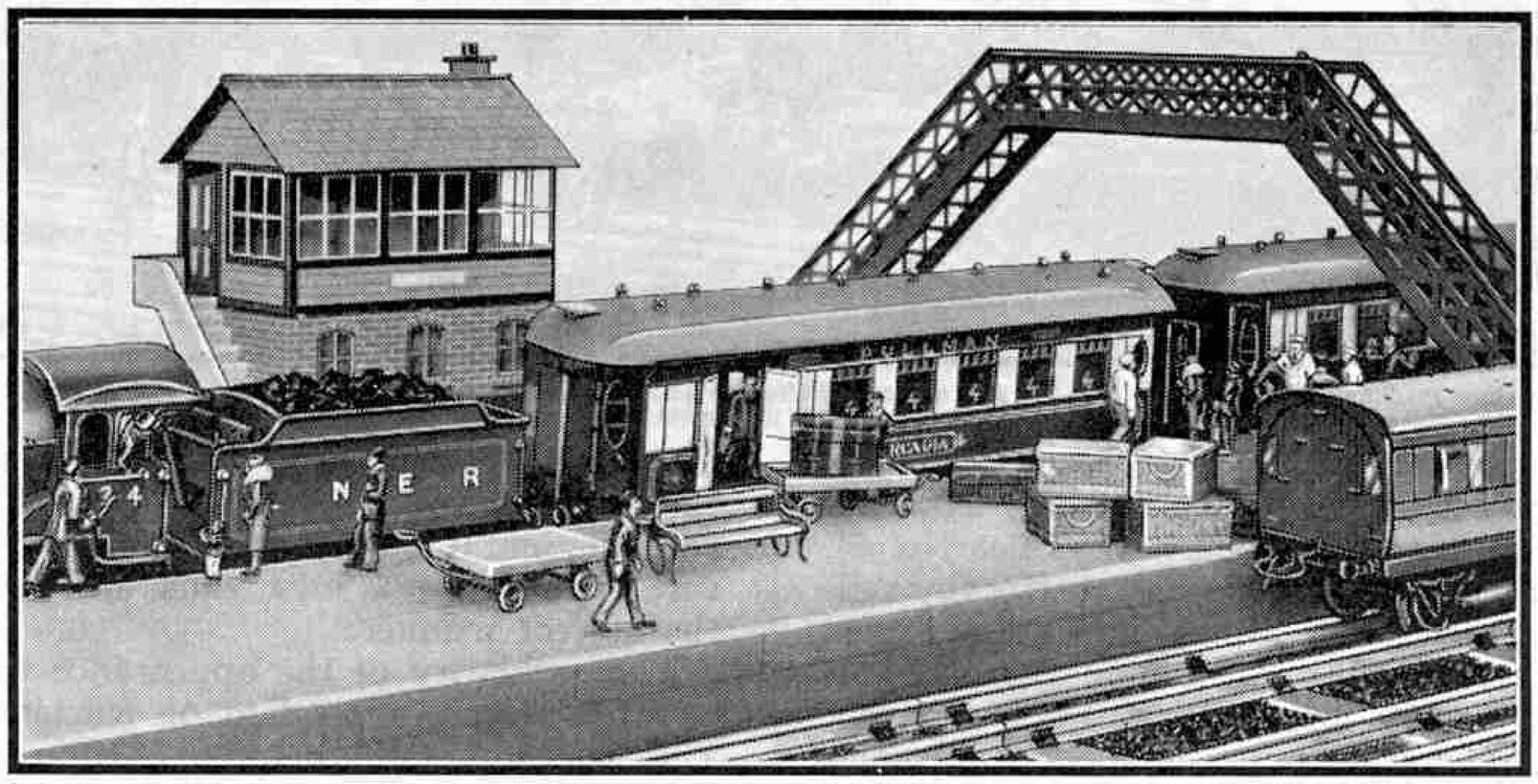
An interesting train of varied composition on a Hornby layout. It represents in miniature the numerous trains operated for general parcels and miscellaneous traffic in actual practice.

The reproduction of night conditions can be effectively arranged on a Hornby railway that is equipped with electrically-illuminated accessories. The room may be darkened, unless it is night time actually, and the trains may be run by means of the accessory lights alone. This is quite a fascinating scheme, and one that is becoming increasingly popular with Hornby *(Continued on page 979)*



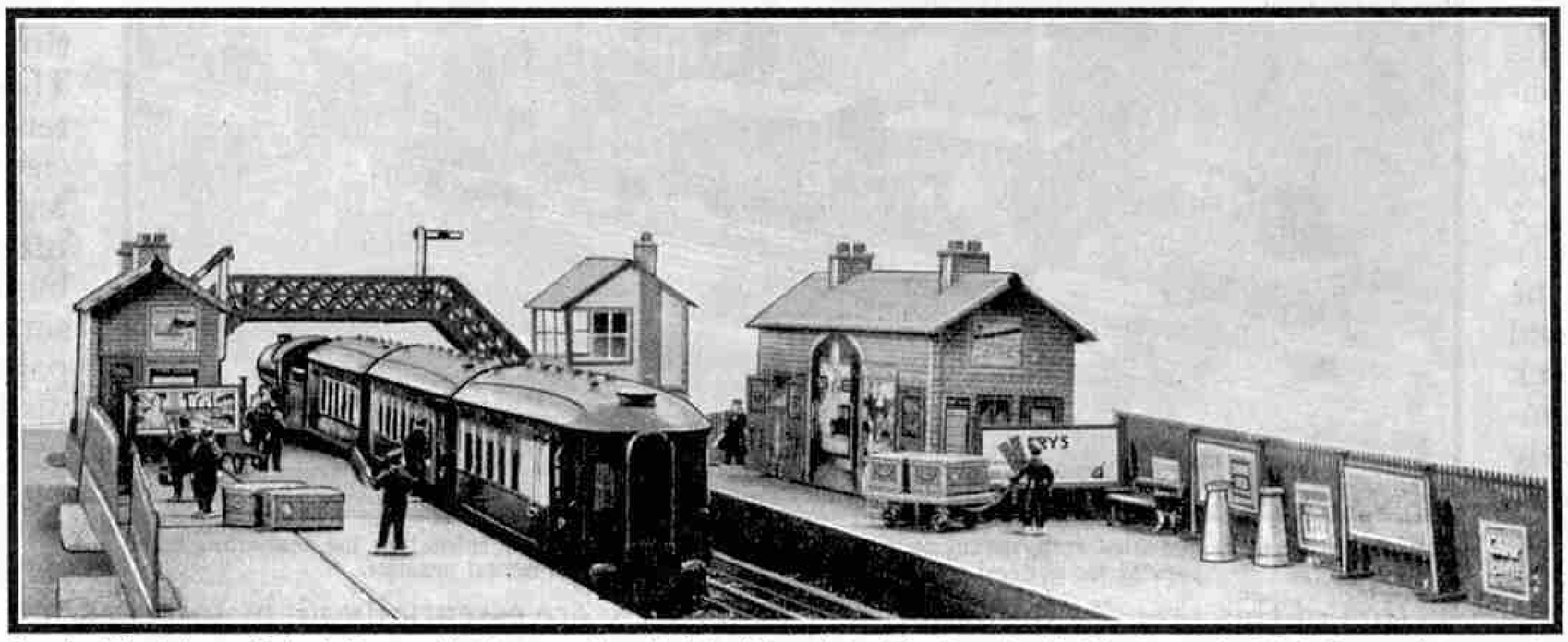
THE APPEAL OF A MINIATURE RAILWAY

IN spite of all the other attractions of this mechanical age, railway trains are still firm favourites with the majority of boys. This keenness for railways finds expression in different ways, but easily the most popular is in the possession and operation of a Hornby miniature railway system. The number of boys who follow this fascinating hobby is constantly increasing, and this article is intended to help those who are just beginning the operation of a Hornby model Railway.



A busy scene before the departure of a Pullman express from a Hornby station. The various Dinky Toys figures and the miniature luggage give the correct air of bustle to the proceedings.

The Hornby Railway System has been developed with a view to making it possible to reproduce in miniature practically every operation of real practice. Every boy likes to watch real trains, and to note each different point connected with their operation, and it is splendid fun to be able to imitate these practices on one's own miniature railway at home. Those taking up the hobby for the first time will soon discover what experienced miniature railway enthusiasts found out long ago—that there is a good deal more involved in the operation of a miniature railway system than merely "playing trains."

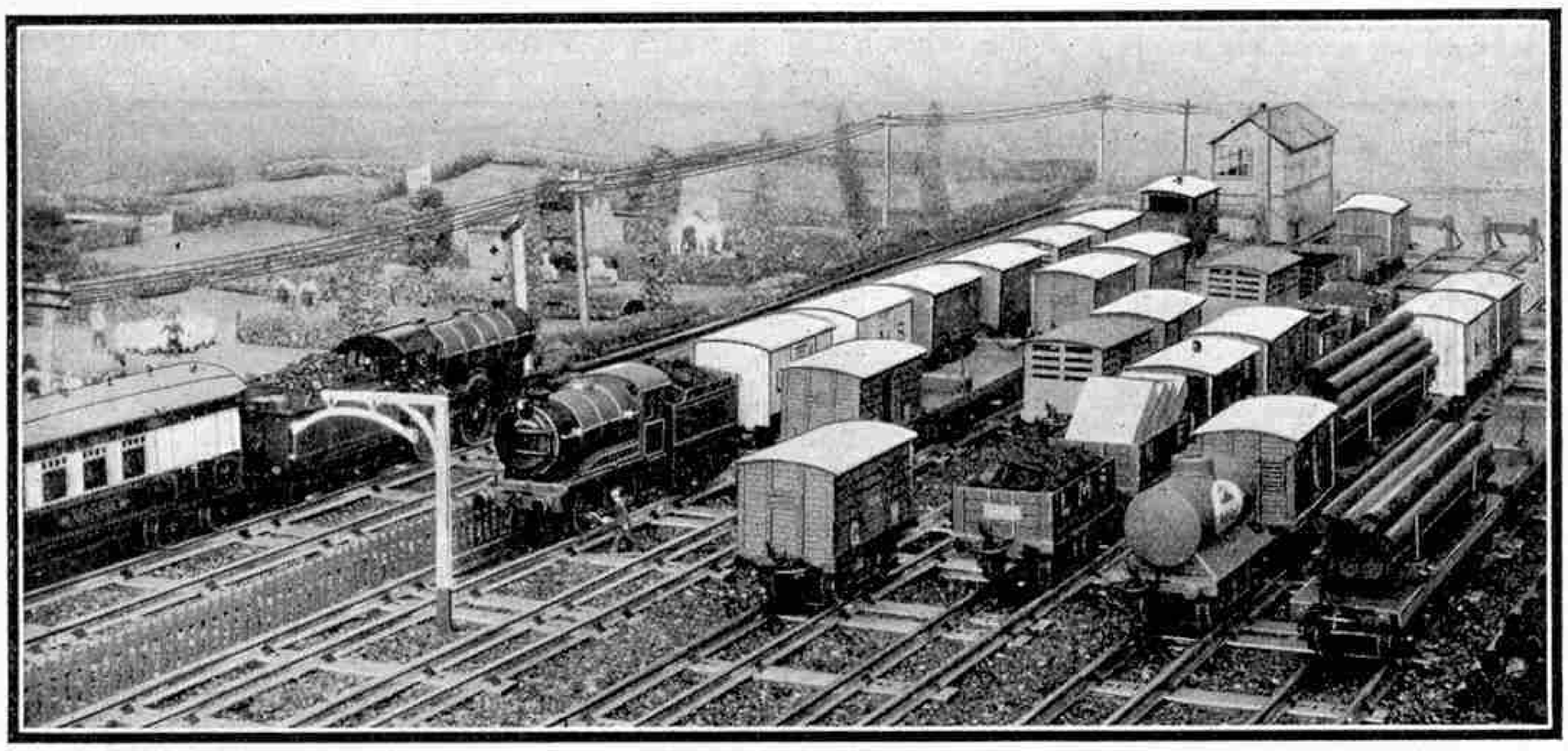


Leaving the intermediate station on the journey described in this article. The Guard with his flag and whistle is prominent on the platform, and the various posters add to the realism of the station.

Before any trains can be run, rails are necessary to form the miniature permanent way, and the Hornby track material provides for practically every requirement of the model railway engineer. Ordinary straight and curved rails are available, the latter made to three different radii. The 2 ft. radius curves are the Hornby standard and enable all the Locomotives and Rolling Stock in the Series to be run. The 1 ft. radius and 9 in. radius curves are for the benefit of those who have only restricted spaces in which to arrange their layouts. In addition there is a complete range of points and crossings that enable interesting and railwaylike effects to be obtained. Tracks can be planned to suit the wishes of all, and can be either permanent fixtures on raised baseboards, or merely temporary layouts arranged on the floor of a living room for the duration of the train running. The actual planning of a track to suit special conditions is an interesting subject, and readers will find it an advantage to consult the new publication "*Hornby Layouts—One Hundred Suggestions.*" Copies of this may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. for 4½d. post free.

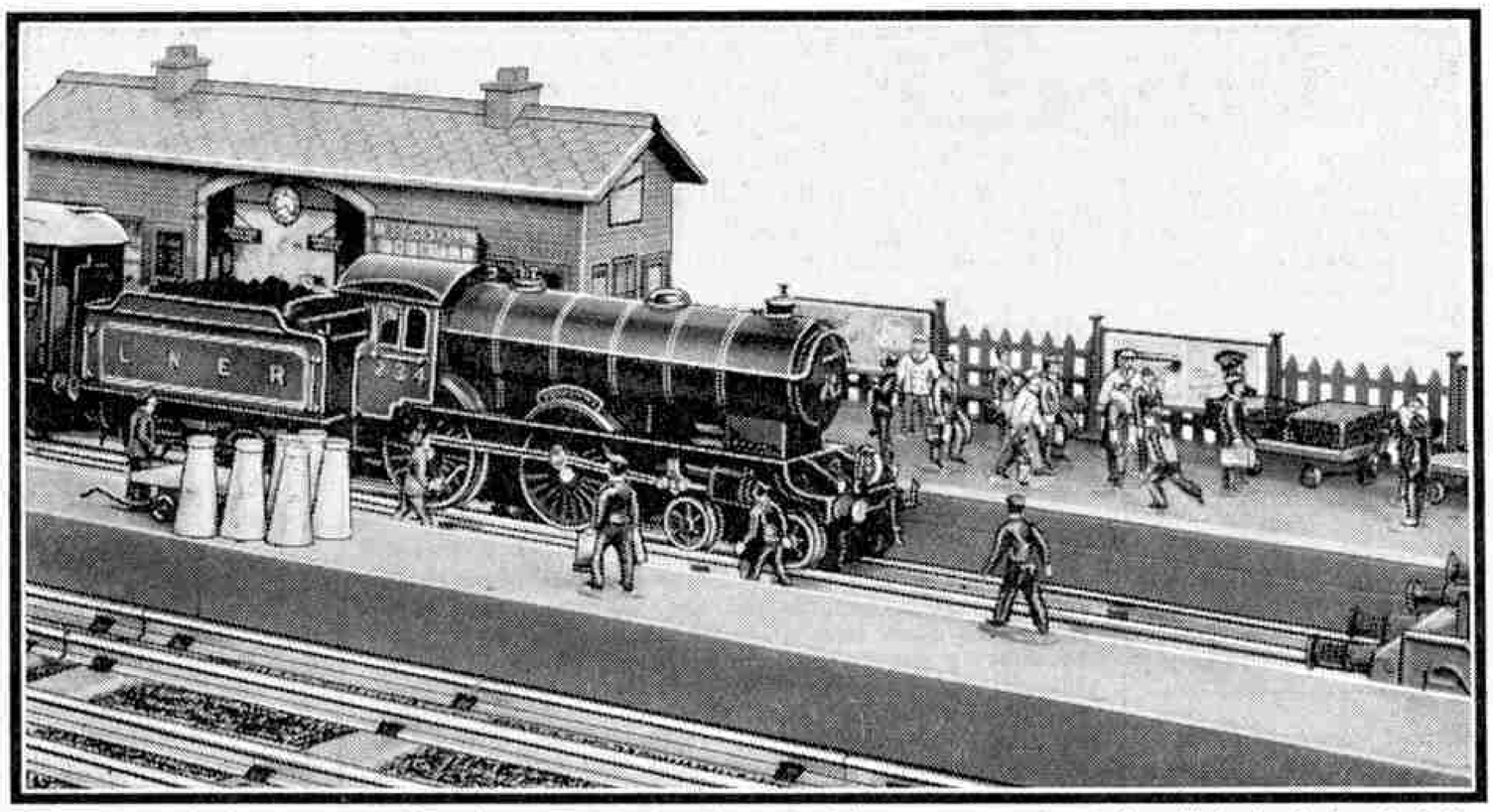
When the track has been decided upon, it is necessary

to consider what locomotives and rolling stock are required. In the matter of trains, both passenger and goods, there is a very wide choice in the Hornby Series, from the large and elaborate Pullman Sets to the equipment of the M Series. Express passenger trains can therefore be included in our services, the degree of completeness depending on the scope of the equipment at our disposal. There is endless excitement and fun in assembling a train of miniature Pullman Coaches, bringing the engine from the Engine Shed and attaching it to the train for a journey over the miniature track! Let us take a brief imaginary journey on a Hornby Train and see for ourselves something of the components and operation of a miniature railway.



Passing a busy goods yard. A variety of wagons is shown in the sidings and an express meat train is on the point of departure.

We will suppose, therefore, that by some magic process we have been reduced to the size of the Dinky Toy figures. As miniature passengers we find ourselves on one of the platforms of a terminal station. Although small in extent the station is well equipped with such things as platform seats and slot machines for the convenience of travellers. A considerable amount of traffic is evidently handled, for there are numerous passengers and a great deal of luggage about, and the railway station staff are having a busy time. Our train is already drawn up at the platform, and consists of three coaches, a No. 2 Special Pullman Coach flanked by two corresponding Composite vehicles, all looking very spick and span.



After the arrival at the end of the journey. Having disposed of its passengers the train will be backed out of the station and prepared for another trip.

We note that Pullman type gangways connect the coaches, and these prevent any bunching up or tendency to derail, the gangways acting in effect like large buffers. Passing along the platform we see that the luggage doors of the composite Pullmans are open, and porters are busy pushing in numerous hampers and trunks. We now meet the smart white-coated Pullman Car staff under the charge of a Pullman conductor, who travel on the cars and look after the comfort of passengers generally. Before entering our coach we decide to go and see what engine is to haul us, so we make our way to the head of the train.

The locomotive is the famous L.N.E.R. "Yorkshire," one of the Hornby No. 2 Specials that are capable of such good work on passenger trains. Like all Hornby clockwork engines they can run long distances and have in addition good hauling power. We cannot but admire the general design and detail of the engine and its tender, for they closely reproduce the main features of the real thing, in common with the No. 2 Special Locomotives and Tenders representing prototypes of the other three groups. The driver is just returning from a last look round before leaving and the fireman is already in the cab.

Soon after we get aboard the train leaves, and if we could have watched its departure we should have seen the guard waving his flag and blowing his whistle as the "right away" signal to the enginemen. Rapidly accelerating we pass over the points outside the station, past the sidings where there are numerous examples of passenger rolling stock. We note in particular some of the new No. 1 Coaches and Guard's Vans that have formed the early morning "rush hour" trains to the terminus. These are waiting until they are required for a further busy period. There are also some No. 2 Saloons being prepared for an excursion that is to follow our own train.

We pass the Engine Shed and we see a fine selection of Hornby Locomotives in its immediate neighbourhood. There is the well known No. 3 "Flying Scotsman" that, like our own engine, is essentially a passenger type. It is ready to take charge of the excursion train that we saw previously. We also catch sight of No. 1 Special and No. 2 Special Tanks that have come off suburban trains and are waiting for their next turn of duty.

Then we plunge into a Tunnel and on emerging we find ourselves in the open country. The picturesque "Countryside Section" district looks very charming from the train and we see flocks of sheep in some (*Continued on page 985*)

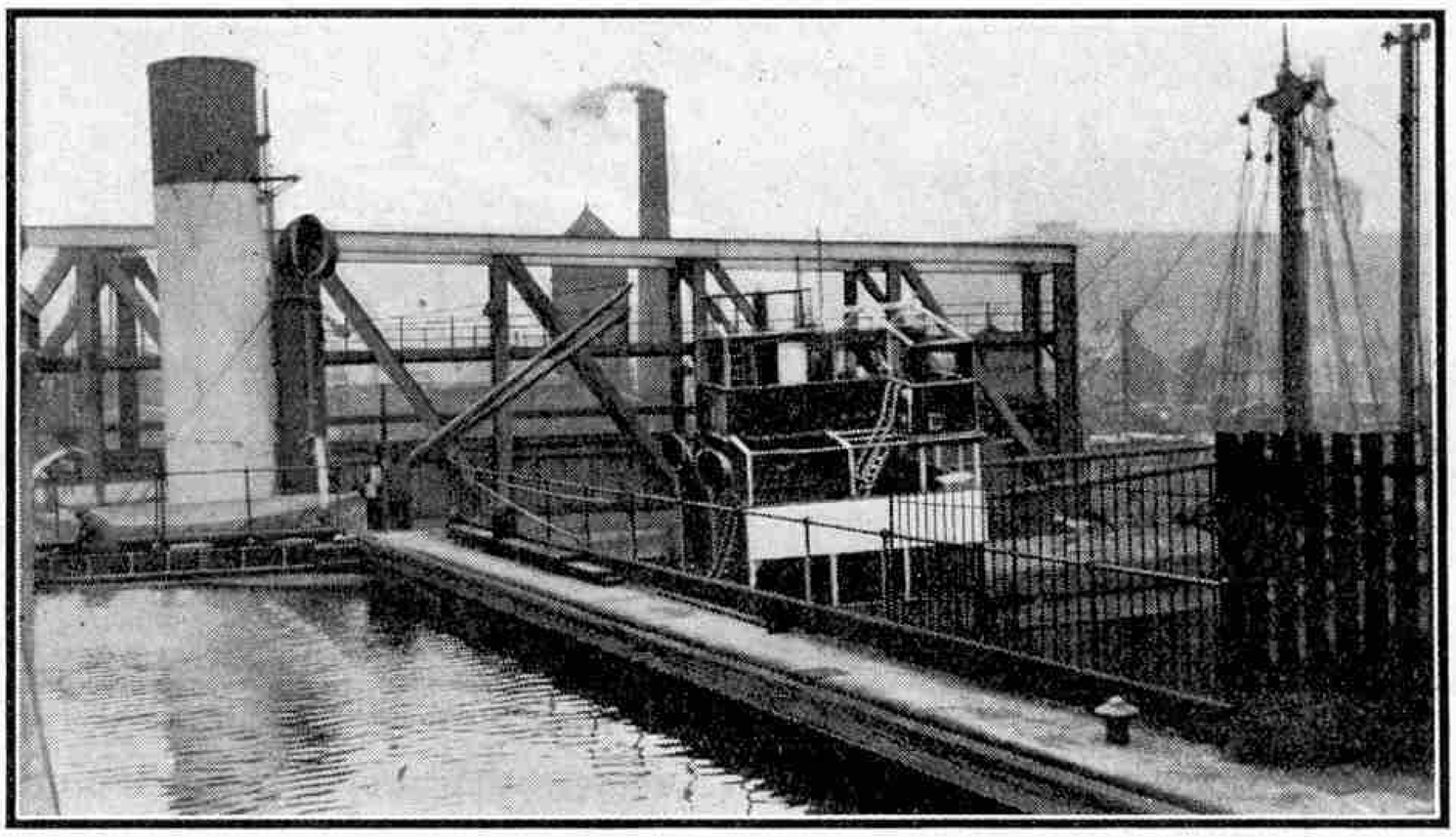
World's Largest Canal Lift—(*Cont. from p. 947*)

upward or downward. Full control both of the lifting and lowering mechanism and of the gates at the ends of the trough is exercised from a cabin that is mounted on the trough itself.

Canal lifts have been in use for many years, but most of these have been hydraulic in operation, two troughs being employed and raised alternately by means of hydraulic rams. An interesting example of a hydraulic lift of this kind on the River Weaver, in Cheshire, is used to raise boats to the canal, which is 50 ft. higher. Its troughs are of wrought iron and are 75 ft. long and 15 ft. 6 in. wide. Each is carried on a ram 3 ft. in diameter working in a vertical cylinder, and little external energy has to be supplied by the hydraulic pumping plant because the ascending and descending weights are practically balanced.

The highest hydraulic lift in the world is at Peterborough, in Canada, where it raises and lowers vessels on the Trent Canal, between Lake Ontario and Lake Uron. Its height is 65 ft., and about six minutes are required for a complete lift. The steel troughs employed are 139 ft. long and 33 ft. wide, and weigh more than 1,140 tons, and they accommodate vessels drawing 6 ft. of water. They are carried in wide towers that rise to a height of 100 ft., and are raised by rams having a diameter of 7 ft. 6 in. and a working stroke of 65 ft. The water pressure employed to operate the rams is 600 lb. per sq. in.

Before the completion of the Niederfinow lift the largest elevator of this kind in Germany was at Henrichenburg, on the Dortmund-Ems Canal, which differs from the ordinary hydraulic canal lift in that only one trough is employed.



This photograph of a scene of apparent confusion was taken in England and has not been altered or faked in any way. Readers are invited to try to identify it. The explanation will be given next month.

Second Dutch War—(*Cont. from page 965*)

were erected and guns hastily mounted on them, and in several places in the fairway ships were sunk in order to obstruct the Dutch fleet. "But strange our confusion!" wrote Pepys in his diary on 14th June 1667, "that among them that are sunk they have gone and sunk without consideration "*The Francklin*," one of the King's ships, with stores to a very considerable value, that hath been long loaden for supply of the ships; and the new ship at Bristoll, and much wanted there; and nobody will own that they directed it. . . . They speak also of another ship, loaden to the value of £80,000, sunk with the goods in her. . . and a foreign ship, that had the faith of the nation for her security."

De Ruyter remained at the mouth of the River Thames until the beginning of July, when he divided his fleet into two squadrons, and sailed with one of them along the south coast of England while the other, under the command of Admiral Van Nes, cruised about the mouth of the Thames. An English squadron of five ships of the line and 20 fireships was got together in the River Stour, and commanded by Sir Edward Spragge it set out to fight Van Nes. The two squadrons met on 23rd July and an action took place that resulted in the loss of five of the English fireships. Spragge continued to pursue the Dutch squadron, however, but before another encounter could take place a second English squadron, commanded by Sir Joseph Jordan, joined forces with Spragge, and the Dutch ships withdrew.

This encounter ended the fighting, and on 31st July 1667 a treaty between this country and Holland was signed. This treaty brought to an end the prolonged hostilities that had continued since 1652, and until 1672 the two nations enjoyed a welcome period of peace.

Blue-Gold Meccano—(*Continued from page 1005*)

Carrier Tricycle

The frame for the rear of the tricycle is made up of 5½" × 2½" Strips. At the forward end, the 5½" Strips carry a Double Bracket, to which the carrier body is pivoted. The body is built up on a 5½" × 2½" Flanged Plate, the sides being formed from Flexible Plates and from the Hinged Flat Plate, part of which forms the lid. Two Trunnions are bolted to the underside of the carrier and form journals for a 3½" Axle Rod that carries the Road Wheels. The drive from the pedals is taken from a 1" Pulley direct to the rear Wheel, and in this case cord must be used, as the stretch is a little too long for the Driving Band.

Parts required for Carrier Tricycle: 4 of No. 2; 2 of No. 3; 12 of No. 5; 2 of No. 11; 6 of No. 12; 1 of No. 15b; 1 of No. 17; 2 of No. 18a; 1 of No. 19b; 1 of No. 22; 1 of No. 23; 4 of No. 35; 40 of No. 37; 10 of No. 37a; 9 of No. 38; 1 of No. 40; 1 of No. 48; 4 of No. 48a; 1 of No. 52; 2 of No. 62; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 187; 2 of No. 190; 1 of No. 191; 1 of No. 198.

The Meccano Jerseys

The special Meccano Jerseys that were announced in last month's "*M.M.*" have met with a warm reception, and we take this opportunity of bringing these Jerseys to the notice of readers who may have missed this announcement.

The Jerseys are made in two styles, one an ordinary Jersey with a turnover collar, and the other a Pullover with a V neck. So far both styles seem to have been equally in demand, and it will be interesting to see which ultimately proves the more popular.

There are eight different colour schemes, and of course all the Jerseys are made in a variety of sizes to suit all ages. Another point of importance is that the colours are fast to light and washing. Every Jersey has a special Meccano tab inside the neck, so that when you see this tab in your Jersey you will know that you have the genuine article. We hope that Meccano Club Leaders who are on the lookout for something to increase the enthusiasm of members will give careful consideration to the adoption of a special Club Jersey of distinctive colour.

The Jerseys are fully described on Page 980 and we specially want all readers to note that these are made in a British factory by British workpeople.

"Brown's Boy Scout Diary"

(Brown, Son and Ferguson Ltd. 1/–)

The 1934 issue is well up to the standard of previous editions, and contains all the features that have made this diary invaluable to Scouts. In addition to the diary pages there are useful notes on the qualifications of each type and class of Scout, and an illustrated list of the various proficiency badges that can be earned. Other important matters dealt with are signalling, map making, weather lore and first aid.

Party Games for Christmas

The business of providing new schemes of amusement for Christmas parties is made easier and easier each year by the ingenious products of British toy and games manufacturers. Two of the products of Geog-Games, of Manchester, "Geog" and "Bad-Egg" are certain fun makers. "Geog" is of an educative nature, but has tremendously funny possibilities; "Bad-Egg" is more robust, and calls for the steering of an eccentric and erratic ball through a series of obstacles up to a target.

Jam-walla, a third product of our advertisers, is an ingenious combination of numerical and jig-saw puzzle. Prizes to the value of £125 are offered to purchasers of Jam-walla sets. Full details are packed in the sets, or may be obtained from Geog-Games, 126, Rusholme Road, Ardwick, Manchester.

Free Super Model Leaflet With this Issue

With each copy of this issue a Meccano Super Model Leaflet is presented free. Our object in doing this is to draw attention to the magnificent models that are described in these Leaflets. The models have been specially designed by our experts to show how machines, mechanisms and structures of all kinds can be reproduced accurately and in working form by means of the standard parts contained in the Meccano Outfits.

The 38 Super Models represent Meccano construction in its most perfect form, and each one is described in detail in a special Leaflet illustrated from photographs. Every Meccano boy should make it his ambition to build some, at least, of these fine models. The instructions in the Leaflets make the various constructional details quite clear, and in the unlikely event of a serious difficulty being encountered, the Editor will be delighted to help.

A full list of the Super Model Leaflets will be found on Page 1053.

The Romance of Engineering

By Dr. A. D. Merriman. 7/6 net.

This finely illustrated book by the Principal of a well-known Newcastle Technical School describes a wide range of subjects and brings out the historical and human aspects.

The Book of Natural Wonders

By Ellison Hawks. 5/– net.

Now published at a cheaper price in the "Modern Boy's Bookshelf" series, this book is exactly as when first issued and contains all the original illustrations.

N.B. Readers of the "M.M." are invited to write for a new list of non-fiction books in the "Modern Boy's Bookshelf," "Seven Seas Library," etc.

HARRAP

39, Parker St., London, W.C.2.

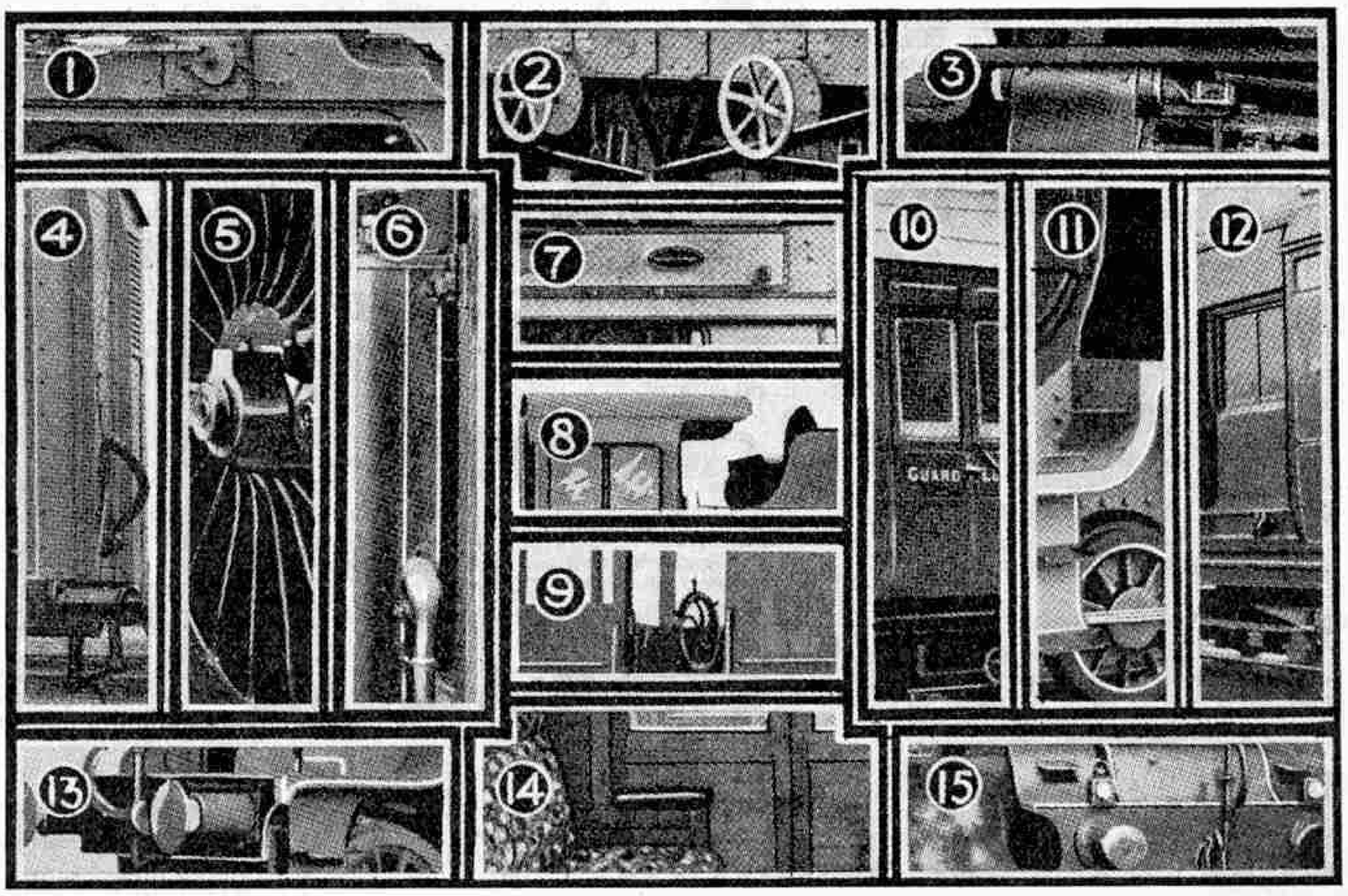
H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

RAILWAY "STRIPS" CONTEST

The four British railway groups possess many different types of both passenger and goods locomotives and many varieties of coaches, wagons and vans. Most of these types have some outstanding features by which they may be distinguished from any other similar class. For instance, no railway enthusiast could possibly mistake an L.M.S.R. 4–6–2, an L.N.E.R. "Pacific," or an S.R. "Lord Nelson" for a locomotive of any other class. These engines are distinctive in their appearance, and are not direct developments of any other class, as are the G.W.R. "Kings," which are related to the "Castles." Similarly an L.M.S.R. flush-sided and low-waisted coach, or a G.W.R. goods brake van, could not be mistaken for corresponding vehicles belonging to other companies. There are numbers of engines, coaches and vans that are not quite so easy to identify, however, on account of the fact that they vary only very slightly from other types.



The most popular Contests that have appeared on this page are those in which H.R.C. members are invited to put their railway knowledge to practical test, and this month we provide another opportunity of this kind. From the identification point of view locomotives are probably the most fascinating, but to add further interest to this Contest we have included a selection of passenger coaches and goods stock.

The illustration on this page shows portions of different locomotives and railway vehicles, and each of the pictures includes some prominent feature peculiar to the particular class represented. Competitors are asked to state which class of locomotive, van or coach is represented by each strip, the group owning it, and the characteristic feature by which it was identified. This last-mentioned item should be as short as possible.

To the competitor who sends in the most accurate solution a prize of Hornby Train or Meccano goods to the value of 21/– will be awarded. To the senders of the three entries judged next in order of merit will be awarded similar goods to the value of 15/–, 10/6 and 5/– respectively. A duplicate set of prizes will be reserved for Overseas competitors. There will be a number of consolation prizes awarded to those competitors whose entries, although worthy efforts, do not quite reach the standard required to qualify for one of the major awards. In the case of a tie for any prize the award will be made to the competitor whose entry is presented in the neatest or most novel manner. On the back of each entry submitted for this Contest must be indicated the sender's name, full address and H.R.C. membership number.

Envelopes containing entries must be marked *"H.R.C. December Strips Contest,"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. Overseas competitors must send their entries to arrive at Headquarters not later than 31st March, 1935. In view of the fact that there is sure to be a large number of entries for this Contest competitors are asked to forward their solutions as early as possible to avoid any delay in the allocation of the prizes.

Railway Photographic Contest

Since announcing the last Photographic Contest in September, we have decided to continue the series during the winter months. Many H.R.C. members are only now printing the photographs they took during the summer months, and have requested us to feature further photographic contests in order to give their efforts a chance of competing. Therefore we again offer prizes this month for the best photograph of *"Any Railway Subject."* Members may submit photographs that have been taken during the summer season, or if they wish they may send prints of typical winter scenes. Entrants may send as many prints as they desire, but no competitor can receive more than one prize in the one contest. On the back of each entry submitted must be given the sender's name, full address and his H.R.C. membership number. A short description of the scene of the photograph should also be given.

The contest will be divided as usual into two sections, Home and Overseas, and prizes of Hornby Train material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the best entries submitted in each section. In the case of a tie, for any prize, the prize money will be equally divided.

Envelopes containing entries must be marked *"H.R.C. December Photographic Contest,"* in top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st December. The closing date for the Overseas Section is 31st March, 1935.

COMPETITION RESULTS

HOME

September "Mixed Names Contest."—First: R. LUMLEY (20253), Swilly, Portsmouth. Second: S. M. JOYCE (16686), Tenbury Wells, Worcs. Third: S. E. SMITH (14228), Enfield, Middx. Fourth: P. J. CHANDLER (1592), Uphill, Weston-super-Mare.

OVERSEAS

June "Name and Number Contest."—First: D. J. WHITE (9333), St. Albans, Christchurch, New Zealand. Second: G. GARDHAM (34769), Katanning, Western Australia. Third: J. H. NEVILLE (23636), Darlington, Western Australia. Fourth: H. H. MATTHEWS (24642), Parramatta, N.S.W., Australia.

June "Railway Photographic Contest."—First: A. A. BOULT, Auckland, New Zealand. Second: H. H. MATTHEWS (24642), Parramatta, N.S.W., Australia. Third: F. L. BINGEN (28995), Wijk-Maastricht, Holland. Fourth: J. A. COATES (23863), Greenfield Park, Quebec, Canada.

June "Drawing Contest." First: S. D. KURLAWALA (28724), Tardeo, Bombay, India. Second: M. CONLY (24290), Dunedin, New Zealand. Third: E. C. HEATH (29104), West Pennant Hills, N.S.W., Australia. Fourth: P. GALDES (14183), Valletta, Malta.

STAMP COLLECTING
—THE KING OF HOBBIES
THIS XMAS

Buy and give Stamp Gifts and make certain of satisfaction by getting them from Stanley Gibbons.

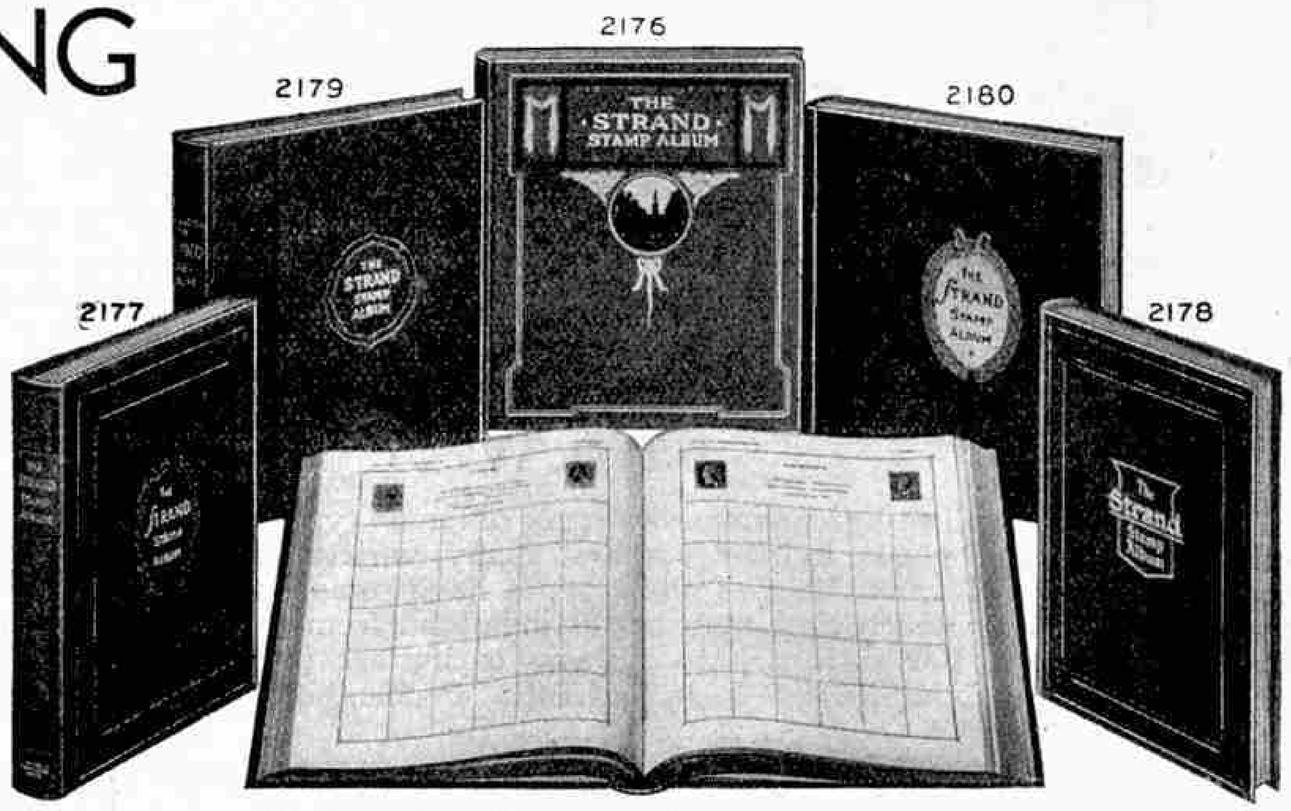
STAMPS

The "PRINCESS ELIZABETH" Special Set of Newfoundland

A brilliant lot of 36 different Newfoundland stamps including stamps catalogued up to 5/- each and with the scarce 6c. Princess Elizabeth stamp unused. A delightful selection of all issues from 1880—Royal Family, Pictorials, Zoo stamps, etc. Total Catalogue Value equals 24/3, but we offer as special bargain at **10/-**
Ask for Set 4334. 36 used and unused.

OTHER SELECTED UNUSED SETS

Set No.		No. of Stamps	Price
S 4320	BRITISH GUIANA, 1934. Seven glorious Pictorials. 1c. to 24c.	7	3/—
S 4186	EGYPT, 1933. Air Congress. Air liner, Zepp. and Dornier seaplane	5	2/6
S 4169	GERMANY, 1933. Wagner Opera stamps, complete	9	5/—
S 3843	BORNEO, 1894-1900. Magnificent Pictorials and Zoo stamps. 1c. to 24c.	11	4/6
S 1660	LABUAN, 1902. "Crown" type. Complete to $1...	12	5/—
S 3547	NYASSA Co. World's most popular Pictorials. Giraffe, Zebra, etc. Complete	20	2/6



The "STRAND" and "CRITERION" Albums

STRAND Superfine printed stamp albums, beautifully and strongly bound and fully guarded so that they do not bulge unduly when filled with stamps. Page size, 9¼ x 8 ins.

WITHOUT MAPS
No. 2176. 352 pages. 14,500 spaces. Attractive pictorial binding. Guarded. **5/-**

WITH 8 FINE MAPS IN COLOUR.
No. 2177. 352 pages. 14,500 spaces. Neat cloth binding, bevelled edges. **6/6**

No. 2178. 368 pages. 15,000 spaces. Handsome grained cloth binding, gilt lettered. **7/6**

WITH 8 FINE MAPS IN COLOUR
No. 2179. 384 pages. 16,000 spaces. Library style binding, back and corners grained, bevelled edges and gilt lettered. **8/6**

No. 2180. 384 pages. 16,000 spaces. Handsome binding with leather back and bevelled edges, gilt lettered. **10/-**

CRITERION As the "Strand" but interleaved throughout to prevent stamps rubbing against one another, and with special introduction containing collectors' dictionary, etc.

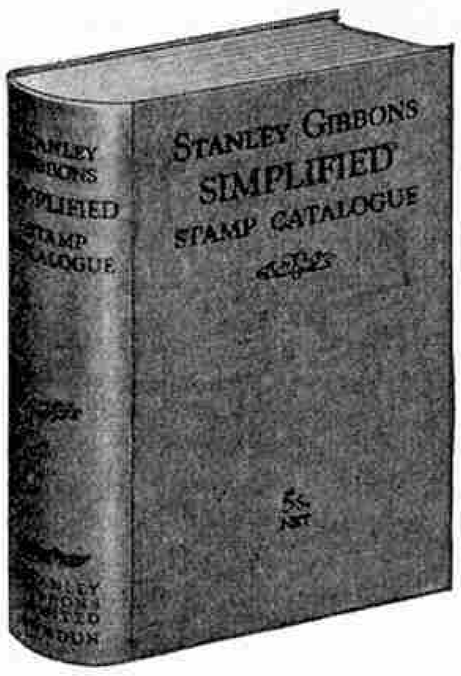
IN TWO STYLES OF BINDING

No. 2506. Very durable grained cloth, handsomely inscribed with title and gold ornament showing the classic "Queen's Head." **12/6**

No. 2507. De Luxe edition. As **No. 2506** but bound in half leather. **15/-**

Postage extra on "Strand" and "Criterion" Albums: U.K. 9d., abroad 1/9.

OTHER ALBUMS including all the famous Stanley Gibbons' Loose-Leaf Albums are fully described in our FREE Album List—see coupon below!



"SIMPLIFIED" CATALOGUE
New Second Edition

The world's best value for money in stamp catalogues. 989 pages listing all the world's stamps (52,300 of them) and with 6,470 beautifully clear full-size illustrations. Simple and straightforward stamp lists (no perfs. or watermark varieties listed) and full pricing. **5/-**

Postage extra. U.K. 9d., abroad 1/1.

HOBBY BOOKS
By STANLEY PHILLIPS

STAMP COLLECTING
The finest guide book on the hobby. Gives collectors clear answers on all the problems they will meet with from their tyro days to the time when they take up advanced specialism. 306 pages. 64 full-page plates. Price **6/6**
Post. U.K. 6d., abroad 11d.

BEGINNER'S BOOK OF STAMP COLLECTING
A **new** book, similar to **Stamp Collecting** but for the younger collector. Includes stamp dictionary and chapter on how to run a stamp club. Price **2/6**
Post. U.K. 6d., abroad 9d.

BY AIR THROUGH THE STAMP ALBUM
A fascinating story of the thrills of aviation as shown by the air stamps of the world. Over 100 illustrations. Price **1/-**
Postage extra 2d.

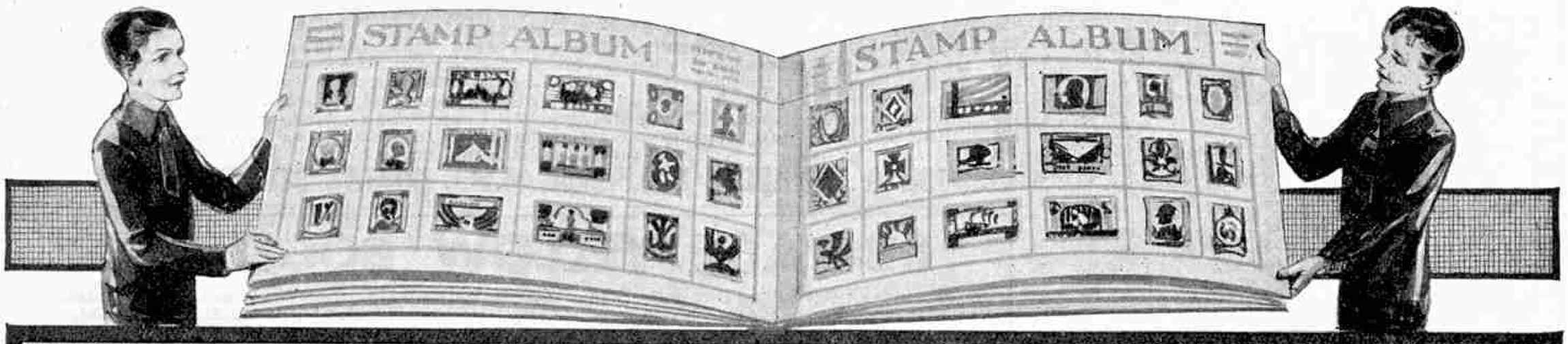
S.G. ALBUMS, CATALOGUES AND BOOKS ARE STOCKED BY ALL STAMP DEALERS, BOOKSELLERS, STATIONERS AND STORES

FREE TO YOU

Every collector should write to us for our two FREE illustrated lists of stamp sets, packets, albums, catalogues and accessories. You will find in them full details of everything for stamp collecting.

THOSE WHO ALSO SEND US A 2d. STAMP (for postage) and ask to see one of the famous Stanley Gibbons' Approval Selections will receive ABSOLUTELY FREE a copy of the Second Edition of Gibbons' Air Stamp Catalogue, a book originally published at 2/6 and which gives full details and illustrations of all air stamps issued up to the end of 1931.

STANLEY GIBBONS LTD.
By Appointment to His Majesty The King
Dept. S.15, 391 STRAND, LONDON, W.C.2



STAMP COLLECTING

MAKING A GOOD START

THE majority of boys who take up stamp collecting seriously are inspired by the gift of an album, and possibly a packet of stamps, from some far-seeing relative at Christmas-time. It would be appropriate, therefore, to address our article this month to those readers who are just making their first steps in the hobby.

The new collector's first desire will be to arrange the nucleus of his collection in his new album. If it is of the fixed leaf variety there is really little choice in the arrangement of the stamps. A definite space is allotted to each country, and there is no provision for extension. The loose leaf album is far more accommodating. Its pages usually are blank, and it is left to the collector to head each sheet with the name of the country to which it is devoted. This may be done by hand or by employing a printed title supplied on gummed paper.

It is well to consider matters carefully before actually placing any stamps in position. Too many young collectors regard their stamp albums as storehouses and not as art galleries. Real collecting, as distinct from mere accumulating, gives a vast amount of pleasure, and when the collection is displayed neatly its attractiveness and interest is greatly increased. Any idea of crowding the album pages to "fill them up" should be abandoned. The stamps must be given plenty of room so that the features of each one may stand out.

A word of warning is necessary as to stamp mounts, or hinges, as they are more frequently termed. It is false economy to buy cheap mounts. The best "peelable" varieties can be bought for 8d. or 9d. per 1,000. The difference between the cheap mount and the good mount is that the good one, when dry, will peel away from the stamp or the album page without tearing little shreds of paper from the stamp, or the album page, or both. In the early days of forming a collection the necessity for moving stamps about arises very frequently as additions are made, and the point is one of real importance. In no circumstances should an attempt be made to remove a mount while it is still damp. Good or bad it will tear.

After the first packet of stamps has been mounted, further supplies must be sought. Those readers who are fortunate enough to have friends in business offices will not lack for supplies of modern stamps, but when supplies from such sources are limited, or earlier issues are sought, additions to the collection must be purchased. The most economical method is to buy what are known as long sets. Many dealers offer in this form really comprehensive ranges of the cheaper stamps of different countries, and the system is a most effective means of securing a nice display quickly. Such purchases must involve duplication of a few stamps that are included in the collection already, but the bulk price of the stamps is far below what would have to be paid if the stamps were purchased individually, and an odd duplicate or two does not matter in such circumstances.

It is at this stage that most collectors come to realise the impossibility of making a big display of the stamps of all countries, and decide to concentrate upon some favourite country or group. The aim then is to fill the gaps existing in the collection of the chosen countries, and short sets of those countries provide the first solution. Short sets usually comprise stamps of a particular issue, and although again they may create duplication, the possibility is very narrowly limited by the collector's own judgment when deciding what to buy.

Gaps will still exist, and the collector must turn to Approval Sheets and "Want Lists" to find the missing stamps. Approval Sheets, as the name implies, are sheets of stamps sent out by dealers to their customers on approval. The collector takes what stamps he wants, and when returning the sheets he pays only for those he has kept. The "Want List" is simply a list of stamps wanted that is sent to the dealer.

So far we have considered only the creation of a reasonably complete collection of a country's stamps, but very many young collectors find it far more interesting to devote their attention to what might be termed "subject" collections.

Stamp designs spread themselves over a really remarkable range of subjects, and some extremely fascinating collections can be built up by collecting only stamps bearing designs of a particular type. Aviation, railways, shipping, bridge-building, electricity, invention, science, mountaineering, sport, natural history and botany are just a few subjects that suggest themselves. Several stamp firms to-day make up "subject" packets and once a really representative collection of past issues has been achieved it will not be difficult or expensive to keep the collection up to date. The purchase of new issues as they appear will not involve many shillings each year.

It is in the subject collection that the possibilities of making an art gallery of a stamp collection are really revealed. If such collections are laid out with a limit of 15 to 18 stamps to the page, and brief descriptions of each of the designs written in neatly below each stamp, the display will be a joy to the collector and a source of interest to his friends.

As a final word of advice, we would urge all our readers to endeavour to acquire an up-to-date catalogue at the first opportunity. A catalogue is as important to a stamp collector as a compass is to a mariner. It provides a list of stamps and their values, and records many helpful details.

It is our aim in the stamp pages of the *"M.M."* to give our readers guidance and help, and each month during the coming year we shall feature practical notes, in addition to recording new issues and interesting happenings in the stamp collecting world. Those of our readers who are in doubt or difficulty in any stamp collecting matter should put their problems to the Editor.

SETS (POSTAGE EXTRA)

5	Bulgaria	2d.	5	Panama	3d.
10	,,	4d.	5	Paraguay	2d.
15	,,	6d.	10	,,	5d.
20	,,	8d.	5	Peru	2d.
5	Guatemala	2d.	10	,,	4d.
10	,,	5d.	5	Porto Rico	3d.
15	,,	8d.	5	Philippines	2d.
20	,,	1/-	10	,,	4d.
4	Iraq	2d.	5	Salvador	2d.
8	,,	5d.	10	,,	5d.
12	,,	9d.	5	Siam	2d.
4	Abyssinia	6d.	10	,,	4d.
8	,,	1/-	15	,,	6d.
12	,,	1/6			

J. RUSSELL
23, Shanklin Drive, Westcliff-on-Sea

The MYSTIC PACKET

1,000 UNKNOWN, UNUSUAL, UNSORTED, **1/3**

Stamps on paper, etc., just as received from Convents, Shippers, Missions, Bankers, etc. Guaranteed unpicked. Chance of a **FIND** in every lot. Send to-day for your treasure hunt to-morrow. **3** for **3/6**, **6** for **6/6**. Abroad, **1/6** pkt. **FREE!** 103 diff. inc. Alouites, Syria, Leban, etc., to Approval applicants. Many other gifts. Send postage only. Overseas **3d.**

ASTLEY & CO. (M.24), LOWHILL, WOLVERHAMPTON.

STAMPS - FREE!! BELGIUM MOURNING & 65 DIFF.

Here is the opportunity to obtain free, the historic and beautiful stamp issued to commemorate the sad death of King Albert. This marvellous offer also includes: **MEXICO,** portraits of General von Hindenburg and King **FUAD,** Wurtemburg, Nigeria, the scarce Ukraine 5g., **SIAM** (old issue), Bavaria (red arms), Sets, mint and obsolete stamps, **CAPE VERDE,** beautiful Upper Volta pictorial, and finally a large unused **GUIANA.** This is a rare opportunity you cannot afford to miss. Send 2d. postage only, requesting approvals. You get the best gifts and stamps from:

LISBURN & TOWNSEND LTD. (Dept. M.M.), NORTON STREET, LIVERPOOL, 3

68-PAGE YELLOW BOOK FREE

100 Illustrations—"Washing Day in the Stamp World"—Glossary of Foreign Words met with in Philately—Three-Cornered Market Place—"Watermarks"—Loose-Leaf Albums from 2/6, Bound Albums from 6d. up—"To Correspondends Abroad"—Single-Country Collections and packets from 1d. to £5—British Empire Albums 5/- up.—Regional Packets—Foreign Colonial Packets—Hinges—Duplicate Books—In fact, **EVERYTHING FOR THE STAMP COLLECTOR.** Free and Post Free. Write for it to-day.

EDWARD SANDELL, 10, EVELYN GROVE, SOUTHALL, MIDDLESEX.

STAMP ALBUM FREE!!

THE "VANBRUGH GIANT" ALBUM. Size 8½×6 inches, it holds **2,700** stamps, and has **150** illustrations. It is beautifully bound in **Stout Pictorial Cover,** and includes full index. It contains 3 special articles of interest to the collector, also a fine pictorial **ANDORRA VALLEY** stamp to go on the first page. Do not miss this great offer which is **absolutely FREE** to all who request approvals and enclose **4d.** stamp for postage and packing. (Abroad 1/-.)

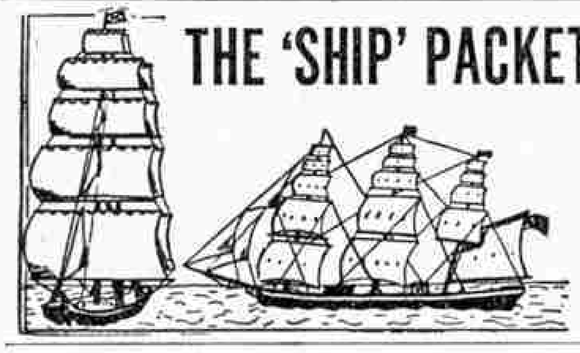
SHOWELL BROS. (M.M. 25), 42, VANBRUGH HILL, LONDON, S.E. 3

FREE! AFGHANISTAN PACKET!

Including **Afghanistan** (1932), **Angola** (redrawn), obsolete Austria, France (**new value mint**), Fr. Morocco (**Sultan's Palace**), Italy (portraits), long set of old Japanese, **Martinique** (new pictorial), **Middle Congo** (**steam train**), **Reunion** (**waterfall**), **St. Pierre** (**new design**), fine long set of pictorial Ukraine, etc. I will send this offer **absolutely free** to all collectors sending 2d. postage (abroad 4d.).

G. P. KEEF, Willingdon, Eastbourne, Sussex

THE 'SHIP' PACKET



This marvellous packet is offered under cost as an advertisement. **48** different stamps **each with a ship on it.** A regular armada. **GABOON,** a rare **FOOCHOW** (War Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **ITALY** (Naval Academy), **NEW CALEDONIA, IVORY COAST, SAMOA** (fine), a fleet of **10 CHINESE** junks usually sold at 10d., **MANCHURIA, BERMUDA, SOUTH WEST AFRICA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, CUBA, POLAND, INDO-CHINA,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **4 SPAIN** (Columbus, each with his ship on it). Money back if not satisfied. Senders of addresses of stamp collectors receive **FREE** set of **4 ICHANG. 100 BRITISH COLONIALS 1/-, 20 AIRPORT 6d., 6 TRIANGULAR 6d.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

FREE! 100 DIFFERENT BRITISH COLONIALS FREE!

This wonderful offer of the World's most popular stamps, from most of the colonies of our Empire, includes pictorials, commemoratives, high values. Bird, ship and animal stamps, out-of-the-way stamps. Long sets, many new issues, etc. ABSOLUTELY FREE TO GENUINE APPROVAL APPLICANTS WHO SEND 2d. FOR POSTAGE. **J. BURTON, 82, Dinas Lane, Roby, Nr. Liverpool.**

BOYS! SEND NOW FOR THIS BUMPER XMAS GIFT

'GRAND YULETIDE" PARCEL of 30 diff. beautiful and interesting stamps includes a **SUPERB SET** of **5 MOZAMBIQUE CO.** depicting products of country (Ivory, Maize, Sugar, etc.), probably most popular set ever issued, N.S.W. (Arms), **SOMALILAND,** Guiana (Archer), **OLD ENGLISH 1841** (unperforated), Gaboon (Raft), **LARGE UNIQUE "FOOTBALL" STAMP** (showing Goalie making wonderful 'save'), set of 5 Austria (obsolete), **ININI** (new issue), New Zealand, **CONGO** (Viaduct), used and unused stamps, old and new, and a **POLISH** stamp issued to commemorate **FIRST POLISH PHILATELIC EXHIBITION.** In addition, as a special Xmas Gift, I am including a fine **PERFORATION GAUGE,** and **UNIQUE HOLDER** with 3 pockets for storing duplicates. **THE ENTIRE XMAS PARCEL** will be sent **ABSOLUTELY FREE** to all serious applicants for my fine Approvals **ENCLOSING 2d. POSTAGE.** Get your stamp collecting friends to write, mentioning your name, and you will receive further fine gifts.

PHILIP J. DYKE, 122, GLADSTONE ROAD, WIMBLEDON, S.W.19

KNOW About YOUR STAMPS
THIS FINE BOOK WILL SOLVE ALL YOUR PROBLEMS
"GUIDE TO STAMP COLLECTING"
60 HEAVY ART PAGES AND OVER 175 FINE ILLUSTRATIONS
PRICE 1/-
POSTAGE 2d. EXTRA

FREE IRAQ KING FEISAL, TURKS & CAICOS ISLANDS OR IVORY COAST

One of the above fine sets **FREE** to all sending for approvals, **POST FREE.** Or **ALL THREE SETS** to those sending 2d. in stamps **and asking for Approvals.** Approvals contain **BRITISH COLONIALS,** beautiful modern **PICTORIALS, AIR MAILS,** etc., priced from ½d. Satisfaction guaranteed to either beginners or advanced collectors.

C. H. SHAW (Dept. M.), 95, Christchurch Avenue, Kenton, Harrow.

I WANT 500

regular customers. Collectors who are so satisfied with the value offered in my selections that they will come to me for all their philatelic requirements. AND I have a scheme which will pay them to become **regular** customers.

Send now for my **4-a-penny selections** and full particulars of the new scheme.

L. D. MAYNARD,
78, Richmond St., Southend-on-Sea.

JUST OUT!!

Our New Price List of Sets and Packets for 1935

You will be surprised at the immense variety of interesting features to be found in this comprehensive publication. Thousands of sets including all the latest pictorials, hundreds of bargains in packets, in fact something for everyone. Why not send for a copy? It is free for the asking.

WHITFIELD KING & CO., Ipswich, Suffolk
Established 1869

Stamp Gossip

and Notes on New Issues

British Guiana Pictorials

The new series of stamps issued by British Guiana on 1st October forms a complete pictorial commentary on life in the Colony, and would make a striking addition to any stamp collection.

A full set of values, ranging from 1c. to $1, has been issued, with designs as follows: 1c., ploughing a rice-field; 2c., Indian shooting fish; 3c., alluvial gold mining; 4c., Kaieteur Falls; 6c., shooting logs over falls; 12c., Stabroek Market, Georgetown; 24c., sugar canes in punts; 48c., road through forest; 50c., Kaieteur Falls; 60c., Victoria Regia Lilies; 72c., Mount Roraima; 96c., Sir Walter Raleigh and son; $1, Botanic Gardens, Georgetown.

The designs of the 1, 2, 4 and 5c. stamps are similar to those of the 1931 Jubilee issue, it will be noted. The difference lies simply in the omission of the anniversary dates.

New East African Stamps

The winning designs in the recent competition for designs for the new stamps to be issued by the Postal Union of Kenya, Uganda, and Tanganyika have been made public. The new designs are to replace the existing separate issues, and the designers were required to embody the portrait of the King, the names of the three territories, and characteristics of the countries.

The winning design is the work of Mr. L. Cutts, of Nairobi. Its central feature is a view of Mount Kenya, and above, an air liner. The King's portrait is inset to the right of the stamp, and elephant heads are inset in the two upper corners of the frame. Two other designs were awarded prizes and, in company with the winning design, have been submitted to the Colonial Office in London for approval, preparatory to production of the new issue.

* * *

This month we reproduce a further six stamps from the popular United States Parks issue, brief details of the illustrations being as follows: 4c., Mesa Verde in South West Colorado; 6c., Crater Lake; 5c., a geyser in the Yellowstone Park; 3c., Mount Rainier (14,408 ft., the highest peak in the State of Washington); 8c., Zion Park, situated on the Rio Virgin in Utah; and 9c., the Glacier National Park.

On Removing Paper

As an improvement on the usual method used for removing paper from chalky-surface stamps, take a large photographic dish, six sheets (at least) of blotting paper to fit bottom of dish, and add a sheet of heavy glass the same size. Soak four of the sheets of dry blotting *in situ*, allow to drain. Place two sheets of dry blotting on top of the soaked ones, place stamps face up on the top sheet and gently lay the glass on top of the sandwich. Leave for about half an hour, and then lift the glass carefully and try peeling the stamps; they should come away easily. There is no risk of damaging the most delicate stamps once a few experimental runs have taught you just the way to handle the job. There is no need to watch the performance. With a 12×10 dish it is possible to soak off several hundred stamps during an evening without having to waste any more time than just that required for lifting one batch of stamps and putting on a new one. A tray once damped should retain sufficient moisture to work for a week and will soak literally thousands of stamps off without re-damping.

One warning—be careful to dry the glass before replacing on a new batch of stamps and be careful to lift, not slide, off any stamps that attach themselves to it.

It is best to keep stamps until a good batch is ready. The 12×10 dish will hold about ninety stamps (cut round as usual). —Mr. S. C. Helps in *Gibbons' Stamp Monthly*.

* * * * *

Following the usual Russian practice of issuing stamps for all happenings of national importance, the U.S.S.R. have issued a short series of special stamps to commemorate the victims of the recent stratosphere balloon disaster. Three stamps, 5, 10 and 20 K. have been issued, each of them bearing a portrait of one or other of the three victims superimposed on the design shown here.

The England Australia Air Race

Included in the load carried by the "Douglas" commercial plane that made so splendid a showing in the England-Australia air race, was 500 lb. of mail franked by a special stamp produced by Holland for the occasion.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations on this page have been made.

Silver Jubilee Stamps

Next year King George celebrates the Silver Jubilee of his accession to the throne, and it is understood that plans are already well advanced for the issue of special commemorative stamps, not only in Great Britain, but throughout the Empire. Although definite designs have not yet been chosen, the design most favoured embodies a composite portrait of King George and Queen Mary, with the inscription "Silver Jubilee."

The designs for the Crown Colonies are also being prepared in Britain, and for each the same theme is being followed, the design showing a typical landscape of the country and, in the top corners, the royal ciphers, *G.R.* and *M.R.*, surmounted by a crown. At the foot of the stamp the inscription "Silver Jubilee" will appear. The Dominions will each undertake the provision of their own stamps to mark the occasion.

If the G. B. series appears, it will consist of four values only, ½d., 1d., 1½d. and 2d., printed in photogravure, but in rather larger size than the ordinary stamps.

Saar Plebiscite Issue

In view of the forthcoming Plebiscite in the Saar Valley Territory in January of next year, two special propaganda stamps have been issued in Germany to help in the effort to regain the Saar for Germany. The stamp illustrated, the 6c. value, shows a pair of hands holding up a lump of coal on which the word Saar is emblazoned.

Before the War of 1914-18 the Saar was one of the most important industrial areas of Germany. Under the Treaty of Versailles, concluded at the end of the War, as part compensation to France for the destruction of her important collieries and industrial plants in Northern France, the Saar Valley was taken from Germany and placed under the control of a neutral commission for a period of 14 years from 1920. At the end of this period, which expires on 31st December, a plebiscite of the people will be taken to ascertain whether they wish to remain governed as they are now; to be joined permanently to France, or to be rejoined to Germany. Germany naturally desires to bring the Saar peoples back to the Fatherland, and the stamps are intended to make all German people "Saar conscious."

HALF-A-POUND FOR HALF-A-CROWN

½ lb. This Mixture is the finest value ever offered. Contains Old and New Issues. Collected from world-wide sources, banks, business houses, shipping offices, &c. From parcels and correspondence. Post Free Inland. Overseas 6d. extra. **2/6**

E. T. COX

89, Sandbanks Road, Parkstone, Dorset

'ALPHA' PACKET FREE!!

Containing new **Australia Centenary of Victoria** (Aborigine in foreground), large 'Ras Maconnen' **Abyssinia,** new issue **Austria,** lovely **Andorra,** new **Angola,** pictorial **Albania,** mint **Algeria** and **Azores,** grand set of 7 large **Austria** views, etc. **All A's. All Free** to genuine approval applicants sending 2d. postage.

HELY HUTCHINSON (M.3), Eddington House, Kendal.

CANADA—FREE!

15 different Canada, including the beautiful **5c. Postal Congress,** shewing view of Parliament Buildings across the river. This stamp is **rising in value** and you are advised to send at once. **All Free** to genuine applicants for our approval sheets sending 2d. postage.

You will be glad you sent.

SHIRLEY STAMP CO.,
19, SANDRINGHAM AVENUE, LONDON, S.W.20.

2/6 Post Free. **"Worth While" CHRISTMAS BOXES** **2/6** Post Free.

Contain approx. 1,000 well assorted **Unpicked** Stamps from Banks, mail order houses, missions abroad, etc., covering old and new issues. Russia, Siam, East, West and South African Colonies, West Indian Isles, French Colonies, Dutch Indies, etc., etc., and many other countries too numerous to mention are represented. Excellent value and will provide many evenings enjoyable and profitable entertainment, sorting, mounting, etc. As a special **Xmas Gift** I will include in each box a stamp catalogued at **4/6** to all who ask for "Worth While" approval sheets.

JOS. H. GAZE, DIDSBURY, MANCHESTER.

COLONY & ISLAND Packet Free ! !

Hard-to-get stamps from out of the way Islands and Colonies. British—**Cyprus, Jamaica;** German—scarce **Marianne Islands** (yacht); Italian—**Eritrea** (camel); Holland—**Dutch Indies;** Portuguese—**Cape Verde;** Spanish—mint **Philippine Islands** (Boy King); French—**Mint Collection** of Island Colonies, and finally a mint **Cook Islands.** FREE to approval applicants enclosing 2d.

C. A. REISS, Dept. M., 1, CASTLE GARTH, KENDAL.

Stamps. Halfpenny approvals. 500 sent. Collection 500 perfect Colonials 12/6.—Wyk, 15, Paradise St., Liverpool.

FREE Set 3 Italian Footballers to all requesting approvals.—Sanders, 90, Newlands Av., Southampton.

Morocco Packet Free ! !

This huge gift parcel contains **507 Unsorted Foreign Stamps,** many scarce from **Morocco** (Sultan's Palace), **Malacca, Sts. Settlements, Brazil** (Aeroplane), **Finland, Ukraine, Kenya** and **Uganda,** etc., etc. **FREE** to ALL sending **2d.** postage and requesting my **Famous Extra-Large-Discount** approval sheets. (Abroad 6d. P.O.)

E. EASTICK,
22, BANKSIDE ROAD, BOURNEMOUTH.

SPECIAL XMAS OFFERS

100 British Colonial, all different, including Air ... **1/-**
25 Italy. Commemoratives, handsome pictorials ... **8d.**
Set of **8 Spain,** Cervantes comm., Official (Cat. 3/-) **10d.**
Set of **9 Charkhari State,** 1931. ½a.—5 rps. (Cat. 4/-) **6d.**
Set of **5 Roumania,** Boy Scout, Mint ... ... **10d.**
Set of **9 Nyassa,** Triangles **1/2**
Set of **3 Soviet Russia,** Stratosphere used (complete) **11d.**
Set of **5 Newfoundland** (Sir Humphrey Gilbert) **6d.**

Cash with Order. Postage 1½d. unless order 2/6

T. R. HUGHES (Dept. M), 7, Winchester Road, N.W.3

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet,** which contains approximately **1,000 UNSORTED STAMPS** from Convents abroad.

1 pkt. 1/6. 3 pkts. 3/9. 5 pkts. 6/-.
All post free. (Abroad 3d. per pkt. extra.)

O. NERUSH
(Dept. K), 68, TURNPIKE LANE, LONDON, N.8, ENGLAND.

Triangles!! Airs!! Pictorials!!!

Including set of unused **Nyassa Triangles.** Set of **Egypt 1933 Air Mails** showing Aeroplane flying over Pyramids. Eight interesting **African British Colonials** catalogued at 5/1. Seven **Canada** including Ottawa Conference Issue. Large **Belgium Piccard Balloon Commemorative** stamp. **5 Russia, 1919 Northern Army** issue. Other stamps include used **Roumania 1931 Air Mails** showing Monoplane, unused Air Mails, surcharged issues and pictorials. Total of 80 different stamps. **Price 6d.**

*14 **Antioquia,** 1899. Portrait type (Cat. 2/11)	6d.		
4 **Belgian Congo,** 1920. Large Air Mails ...	1/6		
4 **Costa Rica Triangles,** 1932. Philatelic Exhib.	1/-		
3 **Russia,** 1933. Stratosphere Balloon Issue ...	1/-		
4 **Russia,** 1934. Mendelejeff commemoratives	1/-		
*6 **Spain,** 1928. Catacombs issue	6d.		
*1 **Spain Triangle,** 1930. 25c. Columbus ...	3d.		
100 French Colonials	1/-	**200 Hungary** ...	1/7
100 British Colonials	8d.	**500 Diff. Stamps**	1/6

*Unused. Postage 1½d. extra.

Money and Postage will be returned if unsatisfactory.

W. BENNETT, 53, Marlborough Road, London, E.8.

FREE—Mourning Stamps Packet—FREE. Send for this fine collection of Mourning Stamps (all of which have been issued to the memory of famous Kings and statesmen, on their death) FREE. **Belgian** (King Albert); **Austria** (Dollfuss); **U.S.A.** (President Harding); **Russia** (Lenin); **Germany** (Hindenburg); **Jugo Slavia** (King Alexander); etc., etc. Receive this packet absolutely free by asking for a selection of stamps on approval and enclosing 2d. Postage. Price of the packet without approvals 1/6. Send a 6d. P.O. and receive in addition a packet of AIR MAILS.

R. W. CLEMENTS, 59, Lee Road, BLACKHEATH, S.E.3

CHEAP APPROVALS

My beautiful Approval Selections are ideal for filling these vacant spaces. Pictorials, Colonials and hard to get items. Selections from 4 a 1d. Free Gift Bi-coloured Persia all applicants.

A. V. TAPP
108, Chesterfield Road, Bristol

AIR RACE PACKET; FREE!!

60 Different Stamps including France, Italy, Greece (Ship), Persia, India, Straits Settlements, Malacca (Tiger), Queensland and finally the NEW MELBOURNE CENTENARY STAMP (Native viewing Melbourne). ALL THESE ARE PLACES PASSED OVER BY MR. SCOTT WHEN HE WON THE RECENT £10,000 AIR RACE.

Just send 2d. Post. and request appros. (Ab. 6d. P.O.)

E. LONGBOTTOM,
Cheam House, Exeter Road, Bournemouth.

free to philatelic students

Never before has such an offer been made. We are offering not one, but **THREE** fine free gift packets containing

1. Airmails. 2. New Issues. 3. Collection of Sweden.

DO NOT MISS this great Christmas offer which will be sent **FREE AND POST FREE** to all genuine approval applicants from the

UNIVERSITY STAMP CO.,
1, PLANTATION ROAD, OXFORD.

WHEN is a DOOR not a DOOR?

All who answer this riddle correctly will receive **FREE** the fine new 1934 **TONGA** pictorial, the 1934 set of **3 ITALY Military Medal** stamps, and the new 1934 **IRISH** 'Hurling' **Sports Commemorative.** All superb pictorials, **just out!** This offer is open for 30 days if you send for 'Seaside' approvals from the dealer 'on the square.' You will get Turkish 'Wolf' and 'Cruiser' stamps **as well,** if postage sent.

H. LINDSEY, 27a, The Square, Lytham-St. Annes, Lancs.

Boys! ask for **THOMAS CLIFFE'S FAMOUS-STAMP-ALBUM**

Best value for 6d. anywhere. This strong, attractive album holds over 2,000 stamps. 100 pages thick, with index. British and only 6d. From enterprising dealers or **T. Cliffe, Colwyn Bay.**

NOT A FREE GIFT

Send me 4d., ask for selection from 4 a 1d. (30 for 6d.), and I will send you 125 different stamps including St. Helena Pictorial, Paraguay Air, Iraq, Persia, Cochin, Palestine, Siam, St. Thome. Without approvals 6d.

J. R. MORRIS, 9, Audley Road, Folkestone, Kent.

Special Offer of Air Stamps

Only 7/6 Per Packet of 100 Different

Stanley Loseby, 39, Carolgate, Retford, Notts.

TREASURE HUNTERS!

Stamps you want on approval at prices guaranteed to astonish. Thousands of attractive stamps at ½th cat. Finest "space-filler" sheets and books of good class. Mention interests. Genuine bargains, no gifts!

Campbell, Haldon Avenue, Teignmouth.

SALE. Good Selection British Colonials, Foreign, Air Mail Stamps. Approx. third catalogue price. Apply—Cooper, 48, Friary Road, London, N.12.

FREE ! Pkt. of Mint Br. Cols. New Issues. Request Approvals.—Shakeshaft, South Road, Brighton.

KINGS' HEADS, Colonial and Foreign Duplicates for disposal. One Farthing per stamp. Send postcard for trial.—Philatelist, 32, Josephine Av., Brixton, S.W.2.

SUPERB APPROVALS. Nothing over half catalogue. —Deed & Co., 16, Avenue Road, Dover.

STAMPS. Canadian and others for disposal. Price—"Springfield," 22, Tyrfran Avenue, Llanelly.

100 Different Stamps Free to applicants for ½d. approvals. Cox, 21, Dennis Mansions, Westcliff.

Free. 75 British Colonials (Cat. 10/6). To genuine approval applicants enclosing 2d., abroad 4d.—Williams, 71, Albany Road, Rockferry, Cheshire.

500 World-wide Stamps 6d.—Way, Cheadle-Hulme, Cheshire.

WRITE FOR BARGAIN PACKET. 50 different Stamps, 6d. post free. Ask for approvals.—Johnson & White, Broom House, Ripley, Surrey.

Reminiscences Assassination King of Serbia. Ill-omen Death Mask Issue now withdrawn. Five values 9d. with "Popular" Approvals. New Issues only.—The Western Imperial Stamp Co., Trowbridge, Wilts.

OUTFIT AND KING ALEXANDER PACKET. The finest outfit ever given away. Mounts, Perforation Gauge, Duplicate Album, Detector, also 51 different Stamps including Stamp of the assassinated King of Jugo-Slavia. All **Free** to approval applicants sending 2d. postage. Abroad 6d. P.O.—M. Wilkinson, 54, Nevill Road, Hove, Sussex.

NEW ISSUE PACKET FREE

This offer includes new pictorials from British Guiana, Grenada, United States, etc. Absolutely FREE to all genuine applicants for approvals. Post paid both ways.

WILLIAMS, 7, ISLINGTON ROAD, TOWCESTER.

"Argosy" Approvals. Rare mint **Nicaragua** (Cat. 7/6), obsolete mint **Bermuda,** beautiful **Persia** Coronation are only part of FREE "ARGOSY" GIFT to approval applicants sending 1½d. postage.—W. Standish, Anson Street, Barrow-in-Furness.

THE FIRST STAMP Ever Issued

(British 1840 Penny Black) for P.O. 1/9! It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further 5/- (cat. 20/-)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/-) for 12/6; 4d. blue (cat. 15/-) for 5/-; and 6d. lilac (cat. 60/-) at 15/-. Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**

NORRIS & CO. (Dept. M), NORWOOD, LONDON, S.E.19.

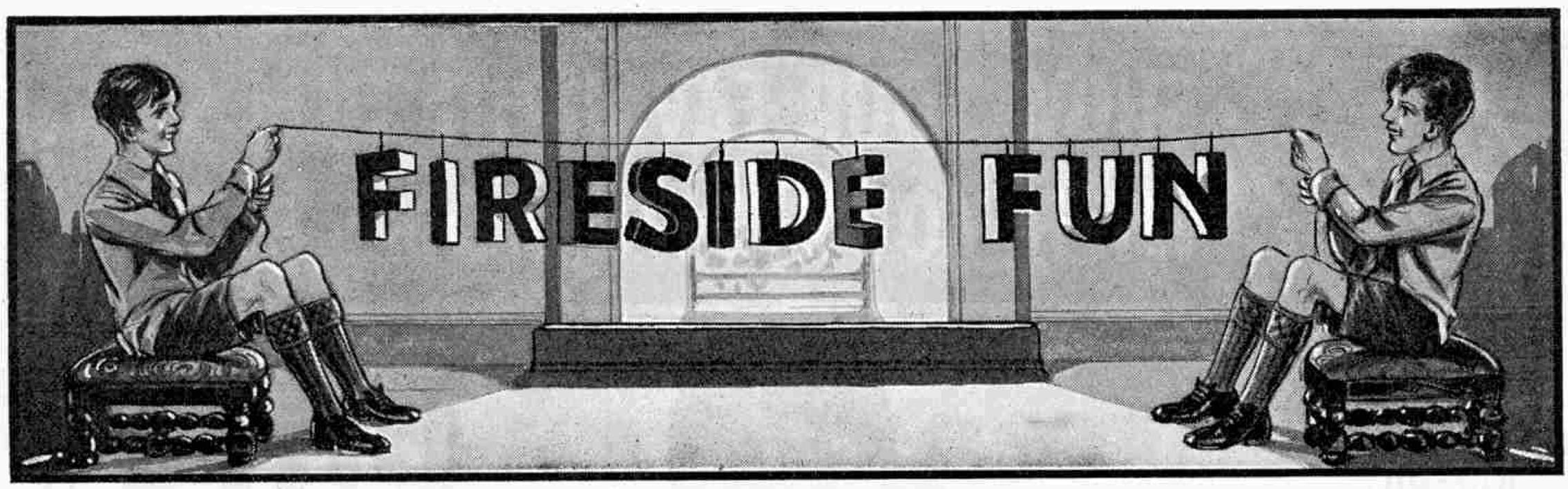
OLD ENGLISH PENNY POSTAGE STAMPS FREE. Issued nearly a century ago. Ten English stamps including 7 postage stamps issued and used postally in **1841, 1856/8, 1858/79, 1887** and **1902** with 3 other stamps (**5/-, 10/-** and **£1**), issued and used for a special revenue purpose, will be given free of charge to bona-fide applicants for selection of stamps on approval. **Very Special.** Grenada (B.W.I.) Pictorials. Just issued. Mint condition, ½d., 1d. and 2d. 3 stamps. Price **5d.,** postage extra.

Henry Turner, 110, Barnett Rd., Preston, Brighton, Sussex

NYASALAND PACKET FREE!

This **Marvellous** packet of **all diff.** stamps contains a fine Brit. **NYASALAND pictorial** new issue, a wonderful set of **5 GOLD COAST,** set of **7 India** including **new issues,** 2 interesting French **Peace, U.S.A. Bi-Centenary, Brazil** (Airplane), set of **3 I.F.S., 2 Nigeria,** set of **3 New Zealand, Ceylonese, Malay States, China, Egypt, Sierra Leone, Uganda,** a Hindenburg **Birthday Commemorative,** and also a set of 6 African **pictorials,** etc. **ALL FREE!** and **NO** damaged stamps. Just send 1½d. postage requesting our famous approvals.

THE PUCKA STAMP CO., 27, Normandy Ave., Barnet.



WELCOME TO IT

The teacher had had her eye on one of the boys in class for some time, and at last she said: "Jimmy Smith, come out here and give me what you have got in your mouth."

"I wish I could," the boy replied, "it's toothache."

* * * *

"How are you getting on at your job, Bill?"

"Fine; I've got five men under me now."

"Really?"

"Yes—I work upstairs."

* * * *

The photographer was "taking" a small child. 'Watch the little dicky bird," he said.

"Just pay attention to your exposure or you will ruin the plate," came the crushing reply.

* * * *

Some soldiers serving abroad were very much troubled by mosquitoes. One night a firefly appeared on the scene.

"It's no use trying to dodge these things," said Private Brown, "the wretches are looking for us with lanterns."

* * * *

"If my boss doesn't take back what he said I shall leave."

"What did he say?"

"'You're sacked!'"

* * * *

The young bore at the party was giving some imitations.

"Now," he said, "I can mimic any bird. Will somebody name a bird, please?"

"A homing pigeon," suggested a fed-up guest.

* * * *

The walker had asked the host at an Irish inn for poached eggs. "We have no poached eggs, sir," said the host, "but I could soon get you some poached salmon."

* * * *

ANCIENT AND MODERN

"Yes, miss," said the guide, "Those pyramids took thousands of years to build."

"I'm not surprised," replied the traveller. "Our builders at home are every bit as indolent."

* * * *

"Now," said the hypnotist, "I shall make this man forget everything."

"Hold on," yelled a man in the back row. "He owes me a fiver."

* * * *

"If you know who stole your car why don't you get it back?"

"Oh, I'm waiting to see if he buys a new set of tyres"

KEEPING HIS WORD

"What do you think of the new shooting tenant?"

"Well, he is at least a man of his word. He promised to send all he shot to the village hospital, and I saw two keepers and a guest pass in the ambulance half an hour ago."

* * * *

SAFETY FIRST

"Now, then, Smith," said the teacher, "if any two angles of a triangle are equal, each to each, can you prove that the two sides opposite the angles are also equal, each to each?"

"Well, sir," said Smith, "I can't prove it—but I should hesitate to deny it!"

* * * *

The little guests at the party were being arranged in a group for a flashlight photograph, and one boy seemed very forlorn.

"Cheer up, sonny," said the photographer. "Smile at this little girl over here."

"Why should I?" asked the boy indignantly. "She's my sister."

* * * *

Anxious Old Lady (on river steamer): "I say, my good man, is this boat going up or down?"

Surly Deckhand: "Well, she's a leaky old tub, ma'am, so I shouldn't wonder if she was going down. Then again her b'ilers ain't none too good, so she might go up."

* * * *

"Did you find it very hot when your ship was in the tropics?"

"Hot? It was so hot that we took turns to go down in the stokehole to get cool!"

* * * *

Speed fiend: "One gets a great thrill out of speeding like this. Don't you feel glad you're alive?"

Friend: "Glad is not the word. I'm amazed."

* * * *

Englishman: "Why is it that all you Americans answer a question by another question?"

American: "Do we?"

* * * *

Beggar: "I was once a soldier, sir."

Colonel: "You were, eh? I'll prove it. Attention! Eyes right! Now what comes next?"

Beggar: "Present alms."

* * * *

He was a fussy little man, and throughout his voyage on the liner he bothered all the officials aboard just for the joy of talking to someone in uniform.

One day he walked up to the captain and with subdued excitement showed him a bright screw he had picked up.

"I've just found this," he said, "I thought you might know where it belongs."

NOT WHAT WAS MEANT

Teacher: "What is there on the outside of a tree?"

Pupil: "I don't know."

Teacher: "Bark, boy, bark."

Pupil (surprised but obedient): "Bow, wow."

* * * *

Mother (returning home): "I hope my little boy has been as good as gold all day."

Nurse: "No. He went off the gold standard about teatime."

* * * *

Lady (to tramp): "Why don't you work? Don't you know that a rolling stone gathers no moss?"

Tramp: "Lady, I ask you, what use is moss to a man in my condition?"

* * * *

House-Owner: "I'm glad you've stopped complaining about the plaster falling."

Tenant: "It's all down now."

* * * *

"Do you find it more economical to do your own cooking?"

"Yes. My husband doesn't eat half as much as he did."

* * * *

"Sorry, son, but that job I asked Mr. Brown to give you has been taken."

"Is that so, dad? I wonder who got it?"

"Er—I'm afraid I did!"

* * * *

Small Daughter: "Muvver, what would happen if baby swallowed a marble?"

Mother: "Why, the little darling would die."

Small Daughter: "Well, it hasn't."

* * * *

"I can't think what to give Bill for a Christmas present."

"Why not give him a book?"

"No, he's got a book."

* * * *

"I would like to settle that little debt of mine."

"I'm very glad to hear it; just step into the office."

"I said I would like to; but I can't."

* * * *

HE DIDN'T MIND!

Diner: "Waiter, is that your handkerchief you're using to clean my plate with?"

Waiter (confidentially): "Don't worry, sir, it doesn't matter, it's only a dirty one."

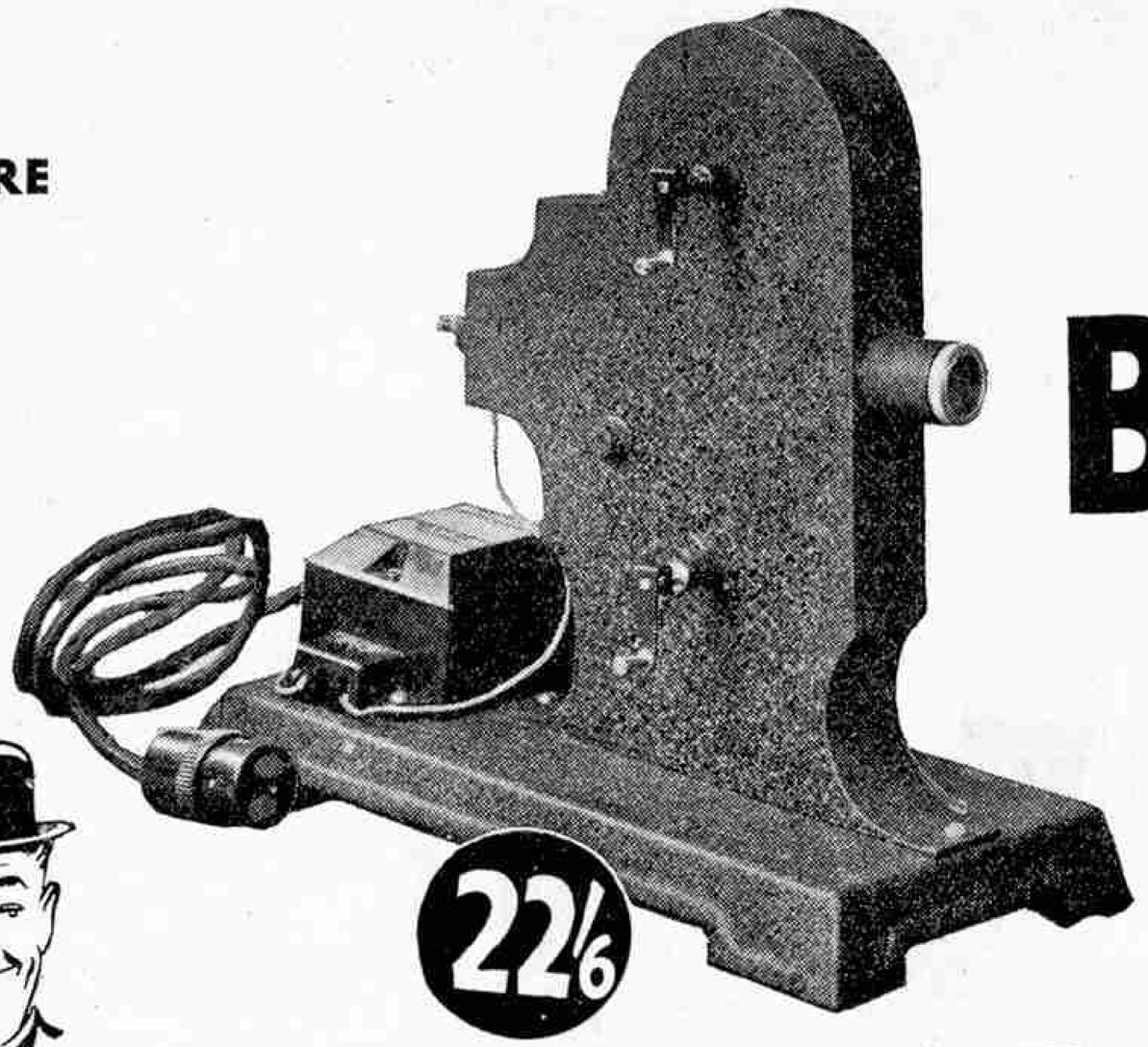
* * * *

The shopper was inspecting a crate of eggs in the village provision stores. "Are these eggs fresh?" she inquired.

"Fresh, madam!" exclaimed the grocer. "Why they wouldn't have been laid till to-morrow if I hadn't torn a page too many off the calendar in the chicken run."

Boys! SHOW YOUR FAVOURITE FILM STARS WITH YOUR OWN HOME CINEMA

ALL FILMS ARE JUVENILE STORIES



BING BRITISH

1934 MODELS ARE SAFETY PROJECTORS & TAKE

Pathéscope

9·5 M/M NON-INFLAMMABLE SAFETY FILMS

EVERY FILM A COMPLETE EPISODE

That's one great improvement this year! Juvenile stories showing famous film stars . . . Charlie Chaplin, Harold Lloyd, Felix the Cat and Stan Laurel, etc. No more disappointing unfinished and uninteresting clippings!

You have a choice of 3 sizes of Safety Films:

15 ft. length, 1/6 each
30 ft. length, 3/6 each
60 ft. length, 6/– each

There are nearly 50 Films to choose from—all specially selected for children. This sets a hall-mark on "*Bing British*" and gives *every* family tip-top home-movies, at very little cost.

HERE'S your big chance to entertain the family and have the jolliest evenings yourself, with a modern Home Cinema.

Look at the smart lines and tempting prices of this year's Models. There is a choice of six: two for A.C. mains and four operated from batteries, and they are all smartly finished in crystalline casing. The films are all non-inflammable and perfectly safe. You can stage a show of all your favourite film stars and direct an evening's programme worthy of the big Cinema Operators.

Don't envy them in their projection room this Xmas; do an expert and exciting job yourself!

Ask for an illustrated leaflet

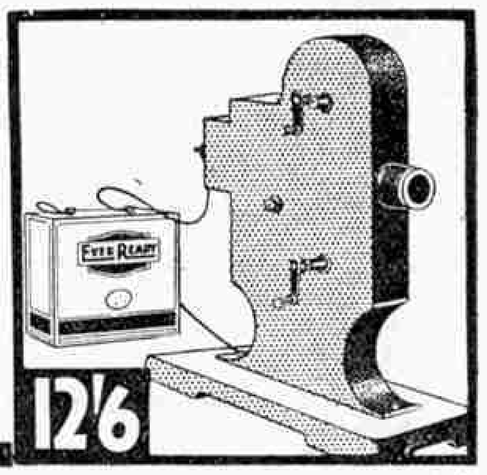
LOOK FOR THIS TRADE MARK —THE SIGN OF QUALITY

PRICES OF BATTERY MODELS

7/6 · 12/6
17/6 and **25/-**

MAINS MODELS

22/6 · 30/-



BING BRITISH — MADE IN ENGLAND — A CONSTRUMENTS PRODUCT

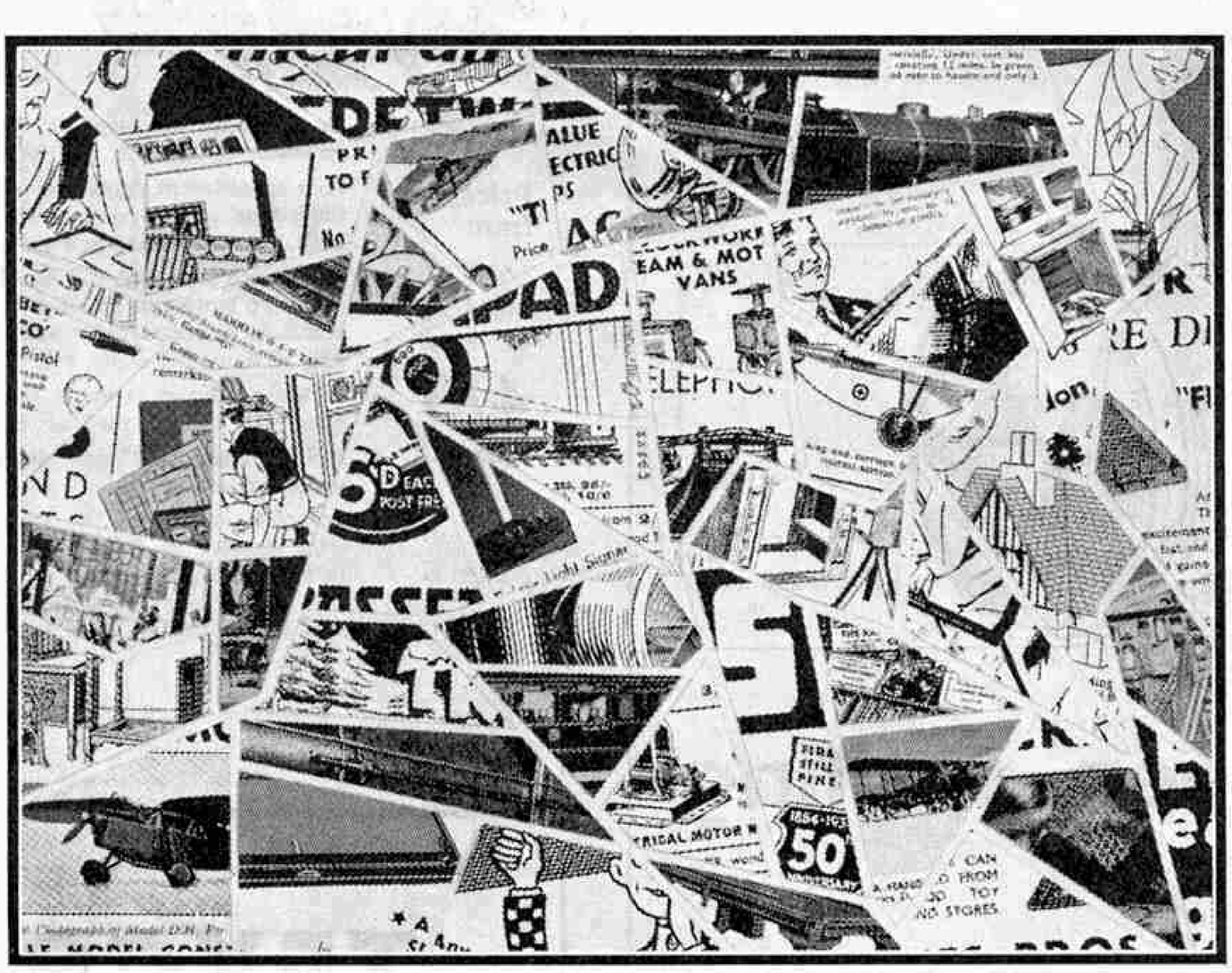
L. REES & CO. LTD. (Dept. M.M.), 12 NEW UNION STREET, LONDON, E.C.2.

royds

Competition Corner

Advertisement "Jig-Saw" Contest

Few features in a boy's magazine at Christmas time rival the advertisement pages in interest, and in repeating the Advertisement Jig-Saw Contest that proved so very popular in the December *"M.M."* last year, we feel sure that our readers will find the problem of sorting out the advertisements represented in the picture a most amusing, interesting, and, maybe, profitable, occupation.



The picture consists of 47 fragments that have been cut from advertisements appearing in this issue of the *"M.M.,"* and our readers are invited to discover the names of the advertisers from whose advertisements the fragments have been taken. Some of the pieces will prove very easy to trace, but others will prove not quite so easy, and, frankly, we hope they will tax our readers' ingenuity to a considerable degree! It is a long long time since we succeeded in setting a puzzle that was completely beyond the capabilities of our readers.

It should be noted that when an advertiser has more than one advertisement, the number of the page from which the cutting is taken must be stated in the entry.

Prizes of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively, to be chosen by the winners from our current catalogues, will be awarded to the senders of the four most accurate lists in order of merit. In addition there will be a number of consolation prizes.

Entries for the competition must be addressed to "Jig-Saw Advertisement Contest, Meccano Magazine, Binns Road, Liverpool 13," and must be forwarded to reach this office not later than 31st December.

A separate set of prizes, to be awarded in precisely similar conditions, will be awarded in the Overseas section, which is reserved for entries from readers living outside Great Britain, Northern Ireland, the Irish Free State and the Channel Islands. Entries for the Overseas Section should be mailed to arrive not later than 31st March, 1935.

Feature Voting Contest

This month's *"M.M."* is one of the largest issues we have ever produced. It is full of special features, and it would be interesting to know which of these our readers consider the best. With this in view, readers are invited to write on a post card (1) the feature they like best of all, and (2) a list of the six features that they consider will prove the most popular with readers generally in order of popularity.

For the purpose of this competition the advertisement pages should be considered as one feature, but each literary article should be treated as a separate item.

Prizes consisting of Meccano products to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in order of merit, who succeed most nearly in forecasting the general order of popularity as decided by the massed vote of all the competitors.

Entries should be addressed to "Feature Voting Contest, Meccano Magazine, Binns Road, Liverpool 13," and must be forwarded to reach this office not later than 31st December. Entries for the Overseas section must arrive not later than 31st March, 1935.

December Drawing Contest

For our drawing competitions this winter we have decided to give our readers a free choice in the matter of subjects, and accordingly prizes are being offered each month for the best drawings or paintings submitted, irrespective of subject, size of the entry, or method of production.

Each month's entries are divided into two sections, A for those aged 16 and over, B for those under 16, and prizes of Meccano products to the value of 21/– and 10/6 respectively, are awarded in each section.

A separate set of prizes is reserved for entries from Overseas readers, to be awarded in precisely the same conditions.

Entries to the December Contest must be addressed "December Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st December. Overseas closing date, 31st March, 1935.

Unsuccessful entries will be returned if a stamped addressed cover of suitable size is sent with the entry. Prize-winning entries become the property of the Editor, who reserves the right to reproduce any entry without fee.

COMPETITION RESULTS

HOME

October Drawing Contest.—First Prizes: Section A, A. E. Lukey (Camden Town, N.W.1); Section B, J. Saunders (Catford, S.E.6). Second Prizes: Section A, J. D. Middleton (Fleetwood); Section B, W. D. Peach (West Cowes). Consolation Prizes: E. Buckman (Redhill); P. E. M. Holmes (Monmouth); M. Clayton (Churt); T. Clayton (Churt).

Point Words.—1. G. W. T. Shorter (London, E.5); 2. R. D. Smith (Epsom); 3. H. Everitt (Streatham, S.W.16); 4. D. M. Davies (Maesteg).

OVERSEAS

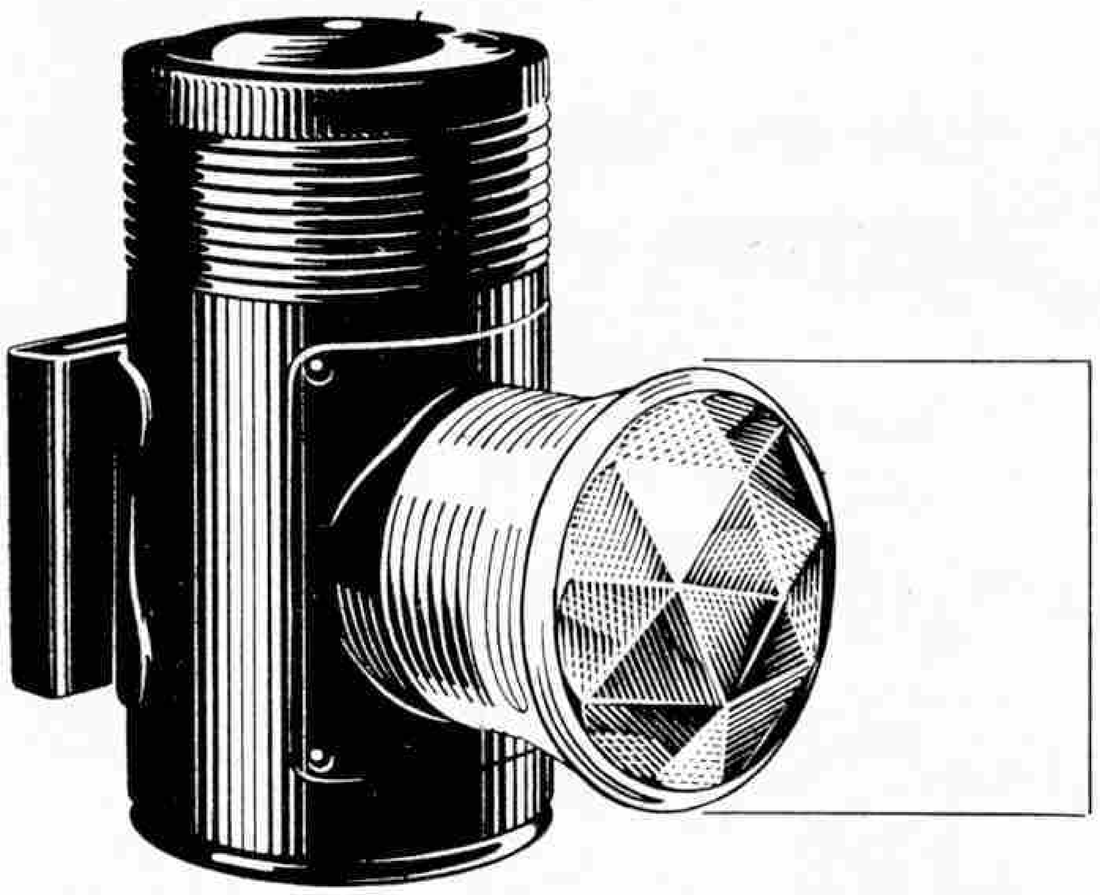
July Photo Contest.—First Prizes: Section A, L. W. Humm (Geraldine, N.Z.); Section B, M. Conly (Dunedin, N.Z.); Second Prizes: Section A, P. Giese (Buenos Aires); Section B, B. Leemsden (Fielding, N.Z.).

July Crossword Puzzle.—The presentation of Miss Myra Morgan's entry to this competition was so beautifully carried out that a special word of congratulation should be given in announcing the results. It is unfortunate that Miss Morgan's entry will not reproduce satisfactorily. The solution to this competition will be given next month. The prizewinners names are as follows: 1. Miss M. Morgan (Cremorne, N.S.W.); 2. N. E. Hodson (Wellington, N.Z.); 3. R. Chorlton (Wellington, N.Z.); 4. G. S. Davies (Dunedin, N.Z.).

April Crossword Puzzle.—1. B. Harrison (Victoria, B.C.); 2. R. Walton (Sydney, N.S.W.); R. Atkinson (Punchbowl, N.S.W.); 4. E. K. Shorrock (Vancouver, B.C.).

April Photo Contest.—First Prizes: Section A, J. Credie (Capetown); Section B, R. H. Warr (Cairo). Second Prizes: Section A, C. J. McCain (Sydney, N.S.W.); Section B, A.Ch. Das Gupta (Bengal). Consolation Prize: F. W. Whyte (South Brisbane).

Here's the
REAR LIGHT



you've been waiting for!

No motorist can miss it!

You're as safe as houses if one of the new Ever Ready electric Rear Lights is shining warningly behind your bike. No more danger, no more mess, no more trouble. Just slip this neat little stoved black lamp on its socket, turn the screw, and the facet bull's eye throws a wide red light behind you. Only 1/6 complete with battery. Refills, to give 35 hours light, 3½d. Every lamp waterproof. At all cycle dealers.

1/6 COMPLETE

Refills 3½D

Regd. Trade Mark

EVER READY

ELECTRIC REAR LIGHT

The Ever Ready Co. (Great Britain) Ltd., Hercules Place, Holloway, London, N.7.

No licence is necessary to purchase if over 17 years of age, and no licence is necessary for anyone to use in the house or garden.

A man's present for manly boys!

No other gift can possibly thrill the sport-loving, manly boy so much as a B.S.A. Air Rifle.

Prices from **45/-** or only **4/3** a month

It is so different from the many gifts which boys receive at Christmas and is well worth worrying Dad and Uncle, or both, to ensure that you get one.

For indoor shooting, B.S.A. Air Rifles are quite suitable. They make no smoke or smell and very little noise, and if you use a B.S.A. Target Holder and Pellet Catcher there will be no fear of damaged walls, etc.

In the garden or grounds, B.S.A. Air Rifles can be used very effectively against rats, rooks, rabbits and other vermin.

B.S.A. Pellets (.177" size) cost only 2/3 per 1,000—37 accurate shots for one penny.

Post the Coupon

Complete and post the coupon below for the B.S.A. Air Rifle Leaflet to B.S.A. Guns Ltd., 92, Armoury Road, Birmingham, 11.

Name.....

Address..... 92/12

TEXCRAFT

MODERN DRAWING SET

Easy, Entertaining, Educational

For children 4 to 8 years. Something quite different.

2/6 and **5/-**. Postage 9d.

CONSTRUMENTS, for older Boys ... ... from **10/-**

NEW BANTAM AEROPLANE **2/6**

Postage 6d.

ALL LOTT'S OUTFITS ... ... from **2/-** to **42/-**

HORNBY Trains, Rolling Stock, **MECCANO** Constructional Sets, Dinky Toys, etc., etc.

WILSON, GUMPERT & CO. LTD.
57, Fargate, Sheffield, 1

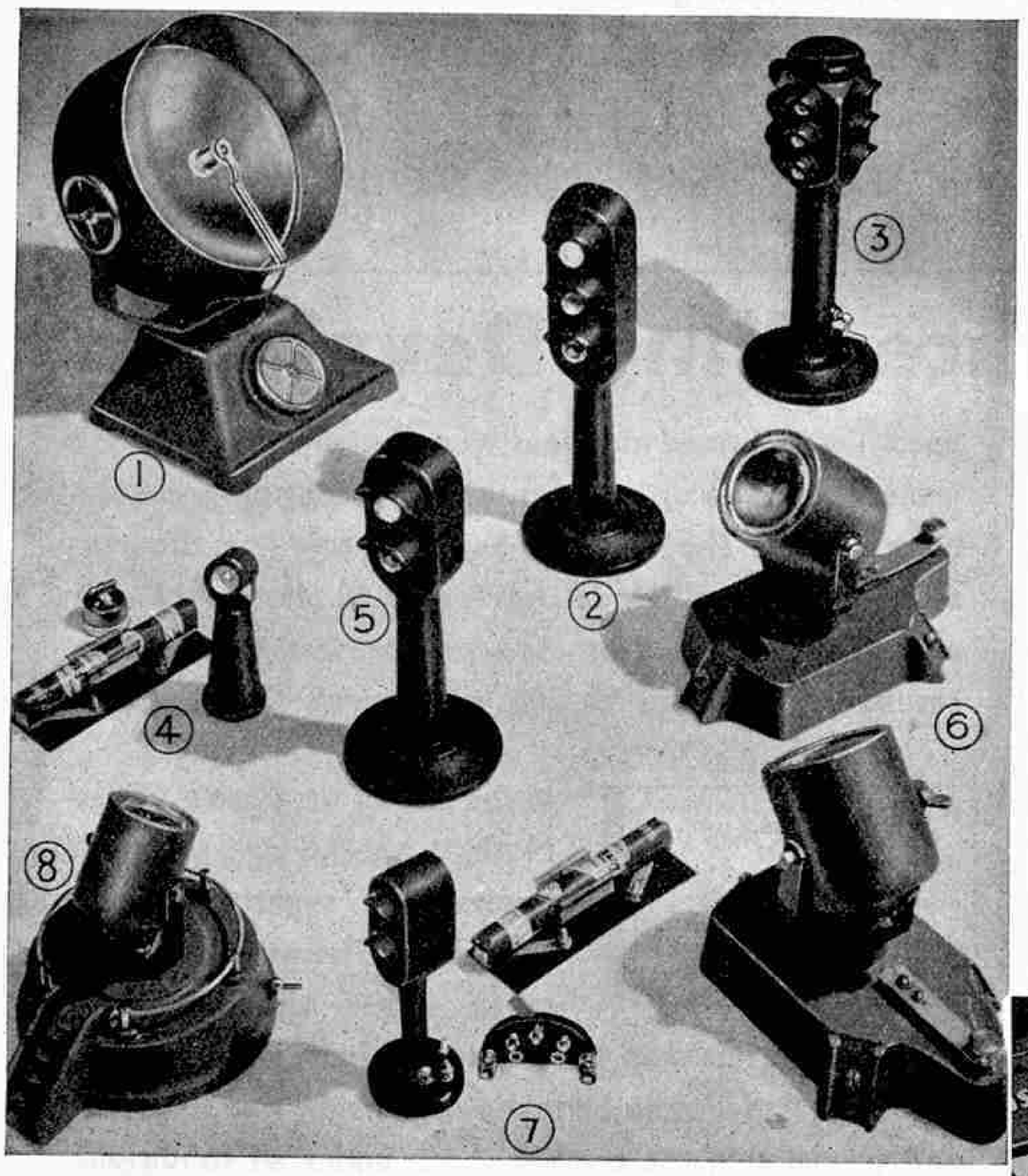
Hamleys News

Estd 1760

·HAMLEY·BROTHERS·LTD

200-202, REGENT ST., LONDON, W.1
(OUR ONLY ADDRESS)

Number Twenty *December, 1934*



1. Kaster Kit Junior, a small home foundry for making your own soldiers and aeroplanes, etc. (foreign) 12/6. Electrically heated set, 30/–
2. Pak-O-Fun Moovy Sho, contains 24 films and blanks for you to make your own cartoons (foreign), 7/6. Post 6d.
3. Ripley's "Believe it or not," a complete set of well-known questions and answers (foreign), 5/–. Post 6d.
4. Microscope Outfit No. 1, complete with slides and tweezers (foreign), 5/–. Post 6d.
5. Microscope Outfit No. 3. Powerful lens, complete with slides, chemicals, tweezers, etc. (foreign), 26/–.
6. Gilbert Erector Outfits enable you to build like a real engineer (foreign). Prices from 25/– to £7.7.0.

I would like to receive a copy of HAMLEYS new catalogue.

Name .....

.....

Address .....

.....

Please use BLOCK letters. M/D.34

TWO PAGES FROM HAMLEYS SUPERB PHOTOGRAVURE CATALOGUE

If you have not received one, fill in the coupon and send it to us TO-DAY.

Electric Signals and Searchlights

1. Adjustable Focus Searchlight, 10/6
2. Three Aspect Signal, 4/9. Post 5d.
3. Four-way Traffic Light, 5/6. Post 5d.
4. Aeroplane Searchlight, 4/6. Post 4d.
5. Two Aspect Signal, 3/9. Post 5d.
6. Morse Signaller, 12/6.
7. Two Aspect Railway Signal, 3/3. Post 5d.
8. Hamley Searchlight, 5/6. Post 6d.

SECRETS of SCALE MODEL AIRCRAFT DESIGN

The second of an interesting series of articles by the well-known designer responsible for the construction of the most perfect of all scale model aeroplanes, the "FROG" and "PUSS-MOTH"

2

How the Double Surface Wing Developed

DISCOVERING THE RIGHT MATERIAL

Last month, I told you why a double surface wing was found to be essential to the success of a model aeroplane. Our next problem was to find the right material for this new design—no easy matter, when the requirements were considered together. This material had to be light; it had to be rigid and strong; it had to remain unaffected by changes of temperature; and it had to stand up to accidental damage. After strenuous tests, we realised that paper of a special kind was most likely to meet each requirement best. We then had a paper specially made to our specification—exactly how special, you will realise when I tell you that metal similar in thickness and weight to this paper had only half its strength.

EXPERIMENTING WITH THE CRASH-PROOF AEROPLANE

Scarcely less important was our next big job. Somehow, we had to find a way of fixing the wings to the fuselage so that forced landings and flying mishaps would not cause serious damage. We experimented with all kinds of devices—with spring clips, rubber retaining bands and a dozen other ideas of a similar character. In each case the result was the same. On its first imperfect landing the machine came to grief. It crumpled up, badly damaged, just as the ordinary toy aeroplane is liable to do to-day.

At last, the patent detachable fitting so famous to-day was discovered. It was quickly seen to be as nearly crash-proof as a model aeroplane could hope to become.

Special complicated machines were designed, special tools manufactured, in order to ensure each wing of 'precision-construction.' The result has been that to-day, if the wing sections of "Frog" Model Aircraft were photographically enlarged, they could be used with perfectly satisfactory results in the design for full-sized aircraft.

ADDITIONS TO THE "PUSS-MOTH"

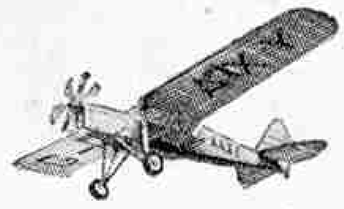
In the case of the famous "Puss-Moth," the wing structure necessitated slightly different treatment. The wing span is so much larger than usual (it measures no less than 1 foot 6 inches from wing to wing) that measures had to be taken to provide extra support and to maintain the correct shape under all conditions. But the choice of material was far from simple. Tests were made. Wood was tried. Metal was tried. Neither was wholly satisfactory. Not until the ribs were made as a high pressure moulding, of immense strength in comparison with their weight, were the requirements of the "Puss-Moth" building standards attained.

NEXT MONTH'S TOPIC

In my article next month I shall have a few words to say about that long established controversy, "The Scale Model Aeroplane versus the Model Flying Machine"—a controversy which the famous "Frog" Aeroplanes have done much to settle. You will find illustrations and prices, with many details, of the "Frog" models on the opposite page.

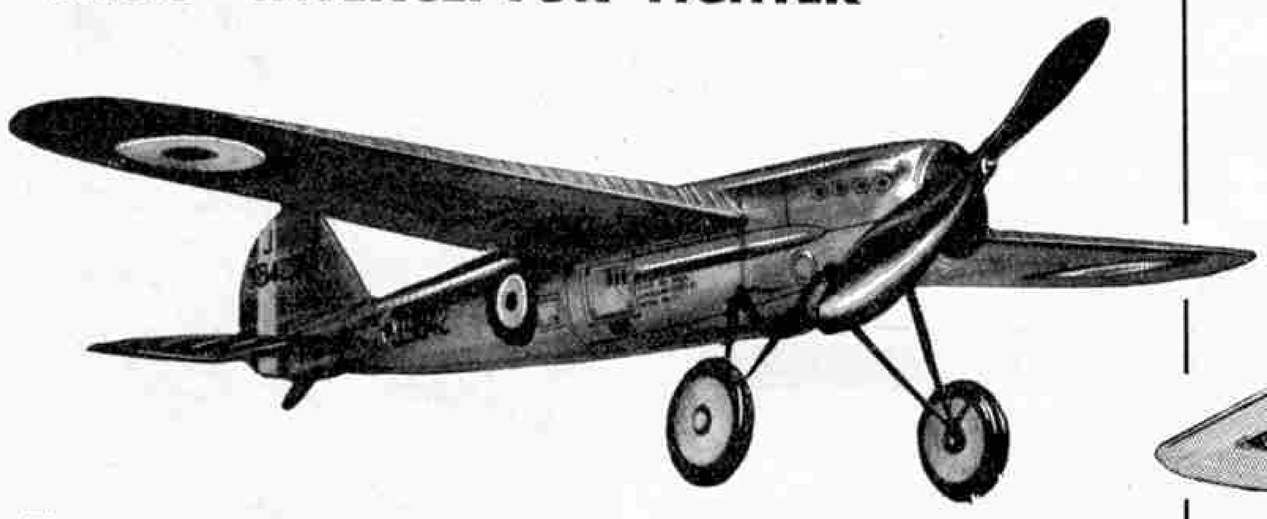
FROG TRADE MARK REGD.

FROG



The Foremost Name in Model Aviation

"FROG" INTERCEPTOR FIGHTER

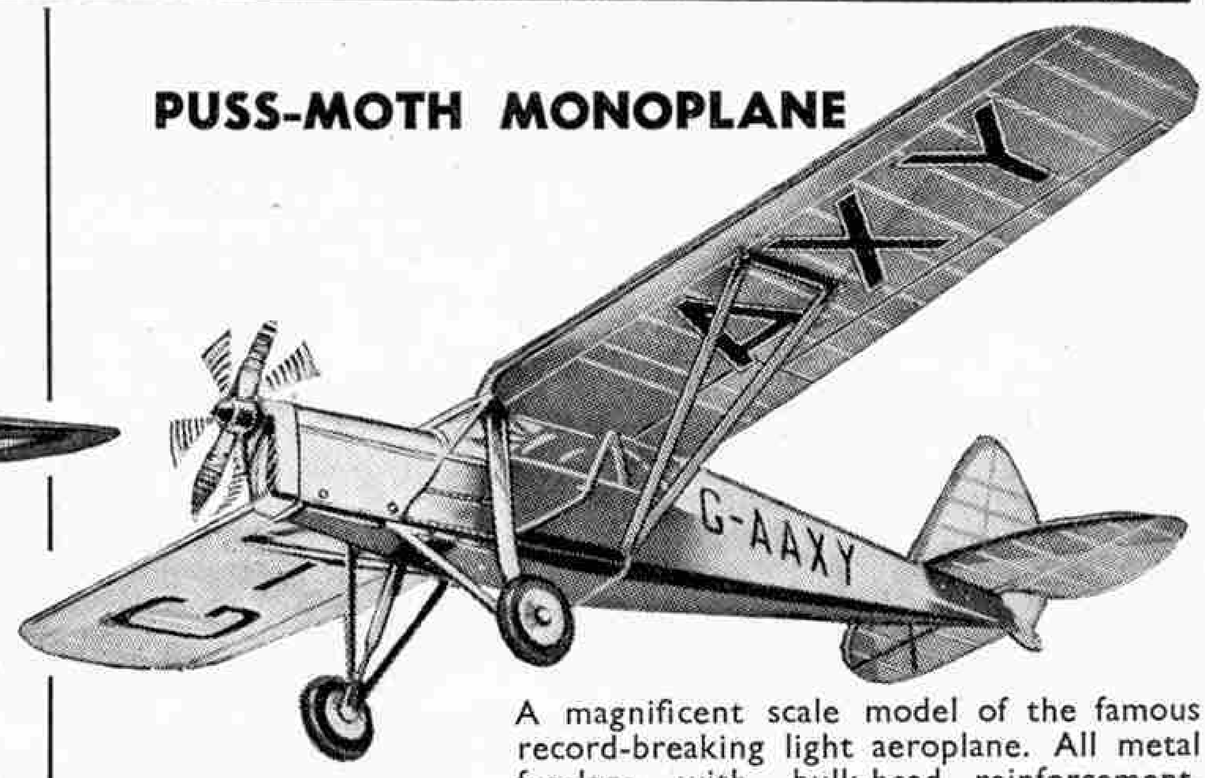


The original and now famous model. A scale model of high-speed Monoplane. Tubular construction, patented quick detachable fittings. High efficiency air-screw. A popular machine for realistic stunting. Seven models, each of handsome appearance and with the correct colours of the following nationalities: British R.A.F., France, Belgium, Holland, Italy, U.S.A. and Argentine. Price including full equipment as specified.

The "Frog" is sold complete with spare motors, lubricant and gear box oil, patent high-speed winder box and illustrated flying manual. Wing Span 11½ ins. Flies 300 ft.

7'6

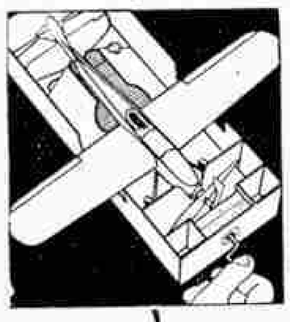
PUSS-MOTH MONOPLANE



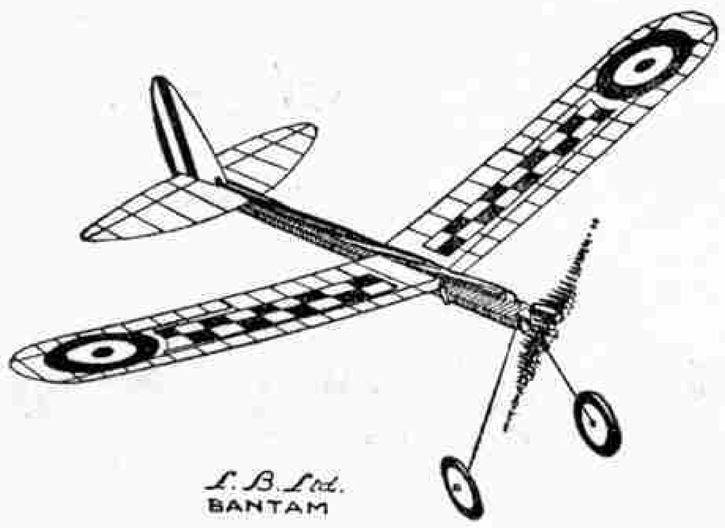
A magnificent scale model of the famous record-breaking light aeroplane. All metal fuselage with bulk-head reinforcement, hollow wings of special design and construction. Dual motor coupled to gear box, transparent cabin and roof lights. "Frog" patent quick detachable fittings and high-speed mechanical winder. The model aeroplane "par excellence." including full equipment as specified.

17'6

The Puss-Moth is sold complete with high-speed winder box, spare motor, insertor rod, gear box oil, elastic lubricant and illustrated flying manual. Wing Span 18 ins. Flies 600 ft.



For **OUTDOOR** *Flying*



2'6

Including spare motor, lubricant, flying hints and high-speed winder-box.

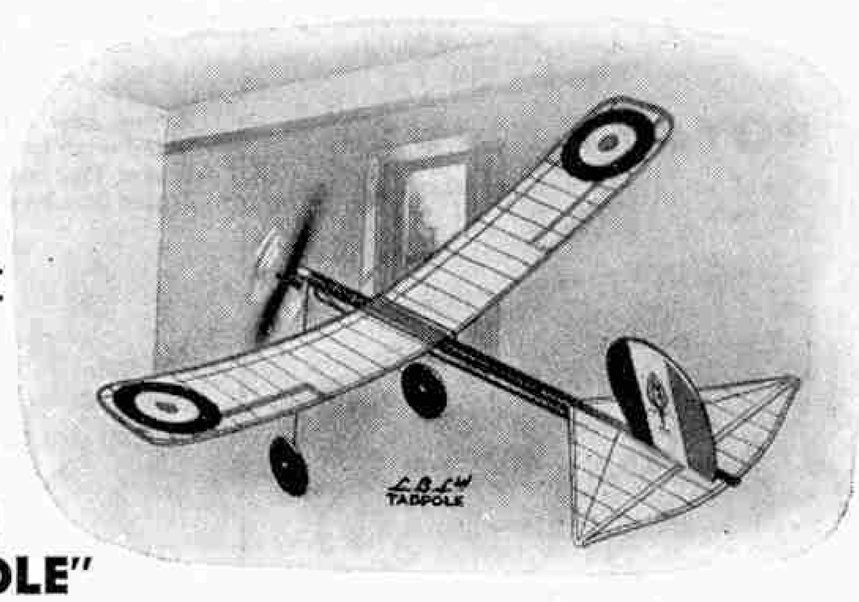
WING SPAN 9 ins.
FLIES 200 ft.

For **INDOOR** *Flying*

2'6

Complete with high-speed winder-box and spare motor and flying hints.

WING SPAN 8 ins.
DURATION 30 secs.



NEWS!
NEW HAWKER HART BIPLANE
Now ready **35/-**

THE "BANTAM"

This splendid new model flies anywhere out of doors. Remarkable performance. The wings are printed in the colours of a famous squadron. Special High-Speed Winder with each model.

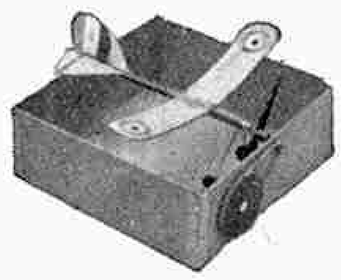
WILL FLY IN A WIND

THE "TADPOLE"

NEW IDEA FOR XMAS PARTY; hold an INDOOR Flying Meeting! Get your friends to bring along TADPOLES and arrange contests for duration flights and stunting. The aerodrome your dining table. Tadpole weighs 1/16th of ounce, no damage to ornaments.

HIGH-SPEED WINDER-BOX eliminates finger-winding.

A "TADPOLE" PARTY IS GREAT FUN!



FROG FLYING CLUB

FROG and PUSS MOTH owners are eligible for membership of the FROG Flying Club. The badges illustrated are obtainable by those members who pass proficiency tests. Write for particulars. Price 6d. each.

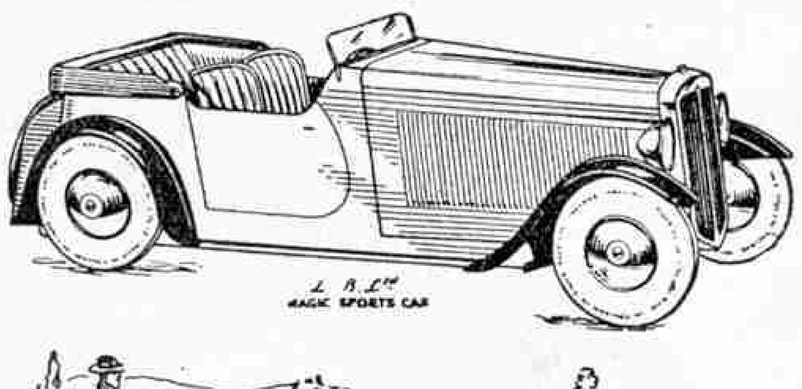
ON SALE AT ALL GOOD TOY SHOPS & STORES

Made in England by International Model Aircraft Ltd.

Sole Concessionaires: LINES BROTHERS LTD., TRI-ANG WORKS, LONDON, S.W.19

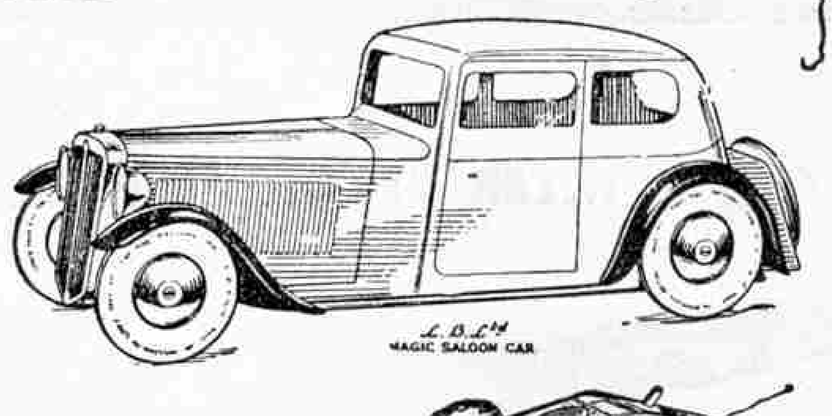
TRI-ANG TOYS

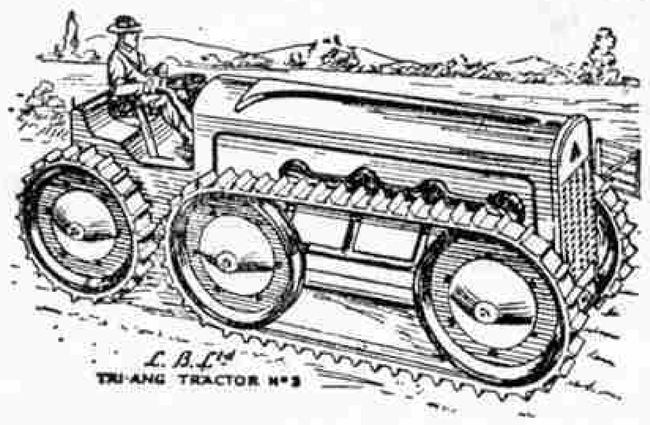
MAGIC SALOON & SPORTS CARS



REAL MOTOR TYPE STEERING AND TRANSMISSION

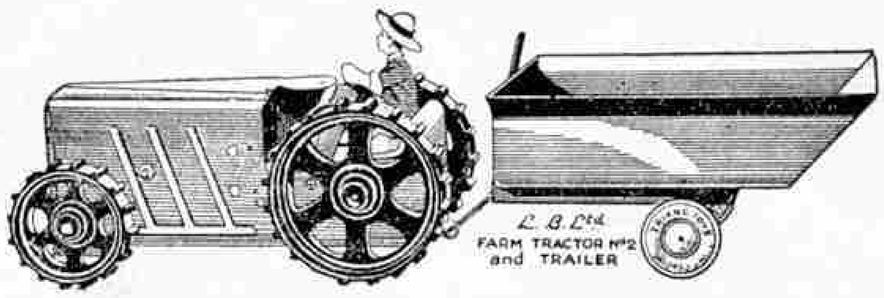
These cars are actually driven with shaft and floating crown-wheel transmission and steered from the driving seat. The steel bodies are replicas of modern automobiles and are fitted with a high speed clockwork motor with stop and start levers. Length 16 in. Either model ... ... Price **10′6**





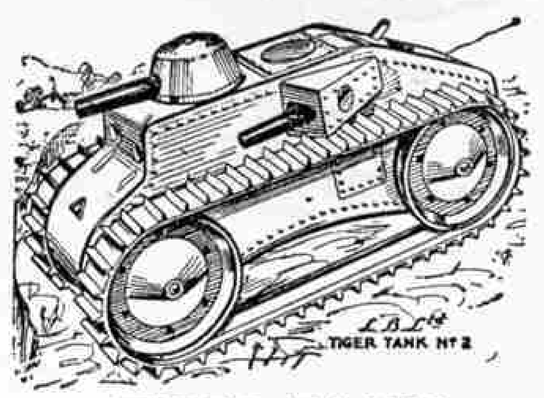
TRACTOR No. 3

A fine six-wheel model with forward and reverse mechanism. Steel body and wide rubber caterpillar bands. Super-powerful clockwork motor. Length 12 in. **7′6**



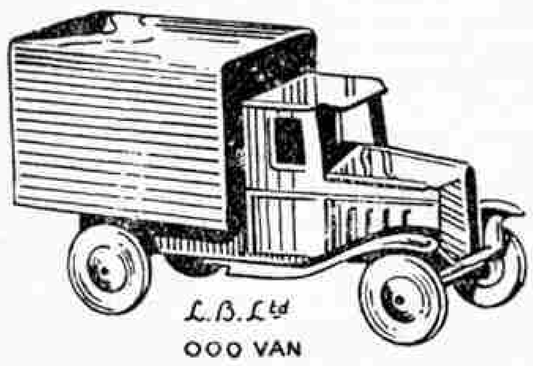
FARM TRACTOR & TRAILER No. 2

A powerful Tractor with steel body and heavy rubber wheels. Steel Trailer with tipping body. Overall length 17 in. Tractor only (less Trailer) 2/11. Complete **3′11**



TIGER TANK

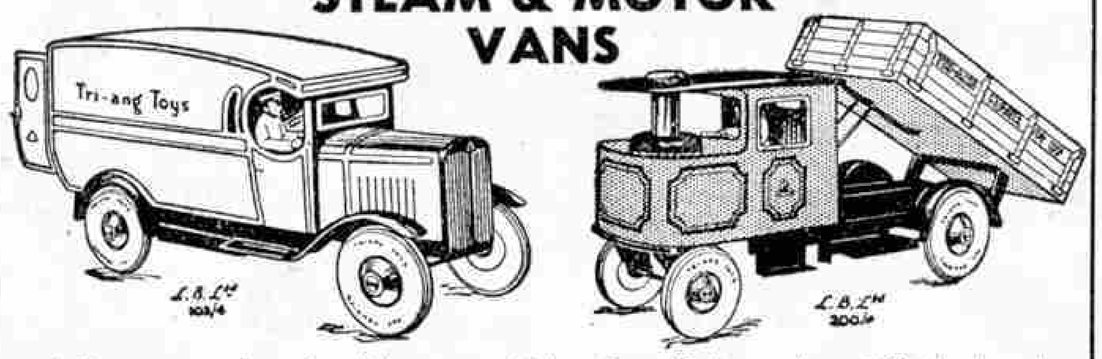
A fine model of a heavy fighting Tank. All steel construction with spring-operated gun. Extra strong clockwork. Wide rubber caterpillar bands. A powerful climber. Length 10 in. **4′11**



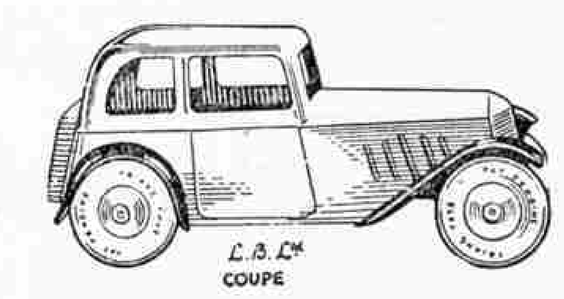
ROYAL MAIL VANS

Steel body and solid rubber wheels. **6d.**

CLOCKWORK STEAM & MOTOR VANS

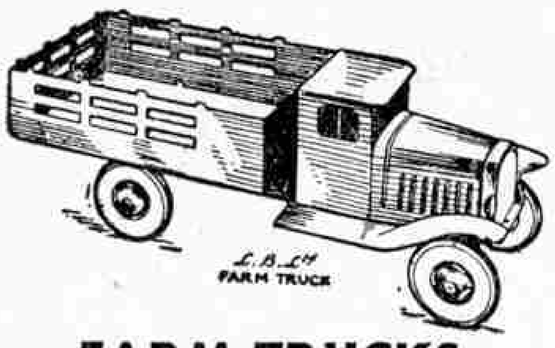


A fine new series of well-known vehicles. Beautifully made and finished and fitted with long-running clockwork and solid rubber wheels. Made as Motor or Electric Light, Steam Tipping Wagons, Motor Delivery Van and Steam Box Van. Approximate length 13 ins. **4′11** **5/11**



COUPÉ CARS

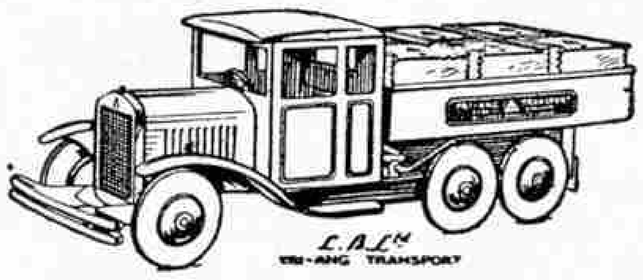
Nicely made steel body with solid rubber wheels. Two sizes. **6d. & 1′-**



FARM TRUCKS

Strongly made of steel with solid rubber wheels. Three sizes. **6d., 1′- & 1′11**

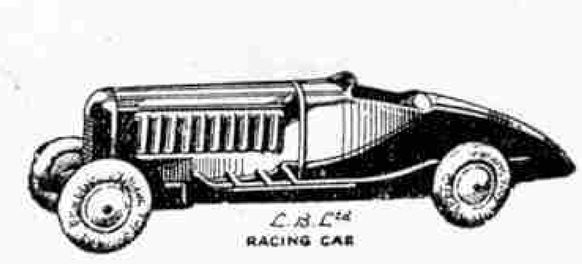
20 ins long



10′6

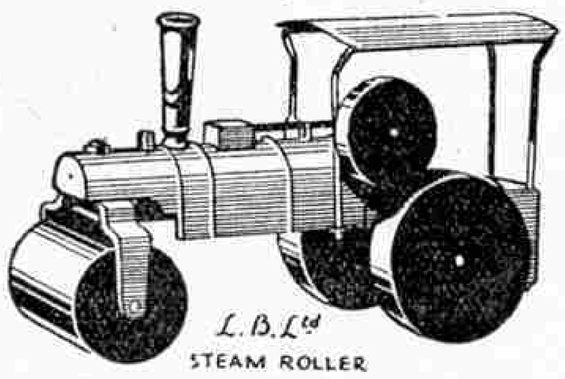
The Famous TRI-ANG TRANSPORT "SIX"

A splendid toy. Made of steel throughout. Patent driving mechanism. Six steel wheels with rubber tyres. Two-link tipping mechanism. Motor type steering from cab. Complete with 6 hardwood cases (with sliding lids) and plated spring bumper. Practically unbreakable.



RACING CARS

Steel body of correct streamline shape. Solid rubber wheels. Two sizes. **6d. & 1′-**



STEAM ROLLERS

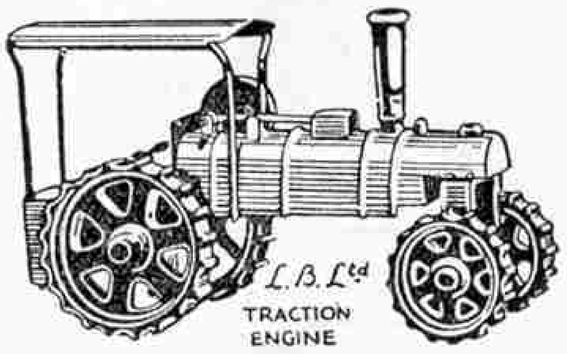
Steel body and solid wooden rollers. Three sizes. **6d., 1′- & 1′11**

TRI-ANG TOYS CAN BE OBTAINED FROM ALL GOOD TOY SHOPS AND STORES.

Ask your dealer for a copy of the new TRI-ANG COLOURED TOY SHEET.

LINES BROS. LTD.

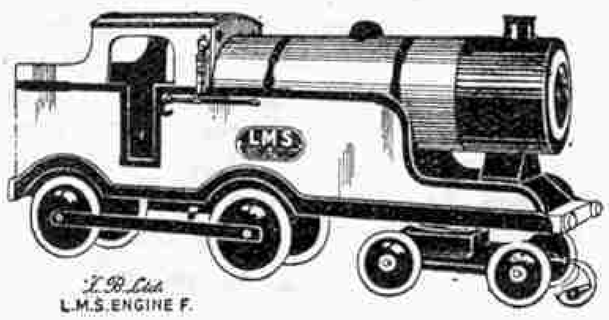
TRI-ANG WORKS - LONDON, S.W.19



TRACTION ENGINE

Steel body and heavy rubber wheels. Three sizes. **9d., 1′3 & 1′11**

TRI-ANG TOYS



L.B. Ltd.
L.M.S. ENGINE F.

L.M.S. ENGINE Model F

Model engine fitted with steel chassis and wheels with rubber tyres. Finished in red and black and complete with whistle. Length 33 ins.

15/6

JUVENILE CYCLE No. 9

Best cycle-tube frame. Adjustable ball-bearings throughout. 16" x 1⅜" Dunlop pneumatic tyres. Two rim brakes, Chrome plated fittings. Finished Black or Blue.

57/6

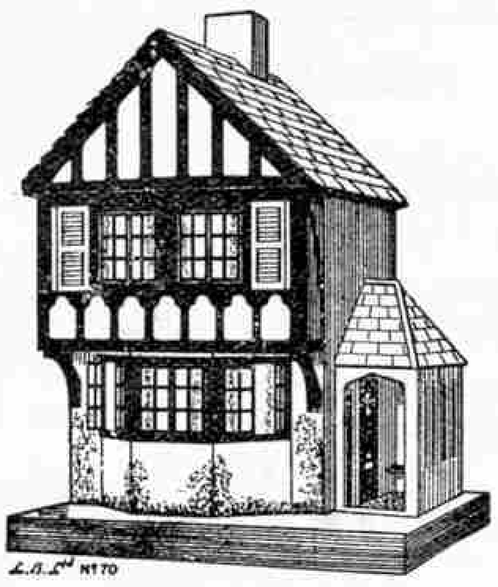
No. 10. Girl's Model same price.

DOLL'S HOUSE No. 70

Timbered house with two large rooms fitted for electric light. Red tiled roof, opening metal windows and tiled porch with seat.

29/6

20 in. wide. 27 in. high.

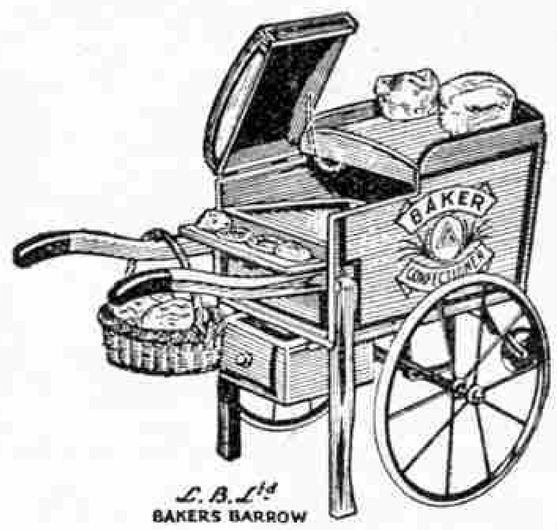


BAKER'S BARROW

Model baker's barrow with hinged top, sliding tray and drawer. Complete with basket, dummy loaves and pastries.

29/6

Length 29 in.

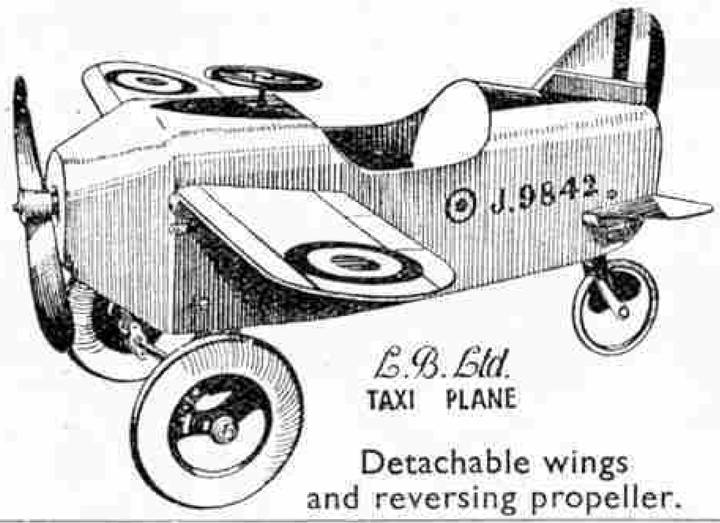


Also made as "Daily Mail" Delivery Van.

ROYAL MAIL VAN

Strongly made of steel. Motor type steering from driver's seat. Two opening doors at rear. Steel wheels with rubber tyres. Plated radiator. Length 19 in.

8/6



Detachable wings and reversing propeller.

TAXI-PLANE

Made of light sheet steel with upholstered cockpit seat. Balloon disc wheels and rubber tyres. Pedal driven with steering from rear wheel. Length 42 in.

39/6

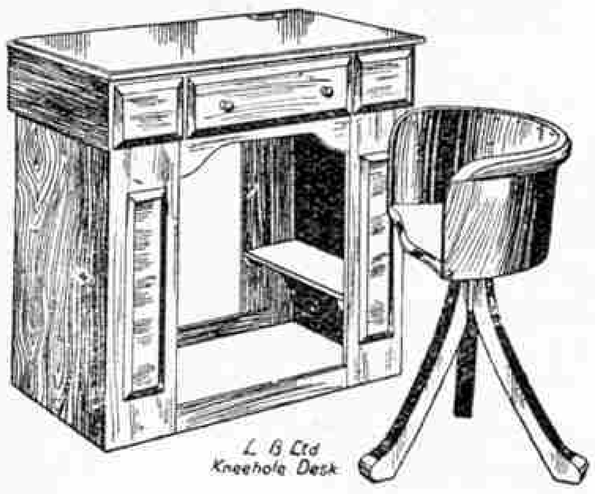
KNEEHOLE DESK No. 1

Finished in dark oak and fitted with centre drawer and two shelves. Inkwell with brass sliding cover. Nicely made swivelling seat. Width 15 in. Height 24 in.

21/-

KNEEHOLE DESK No. 2 With three drawers and padded swivelling seat.

29/6

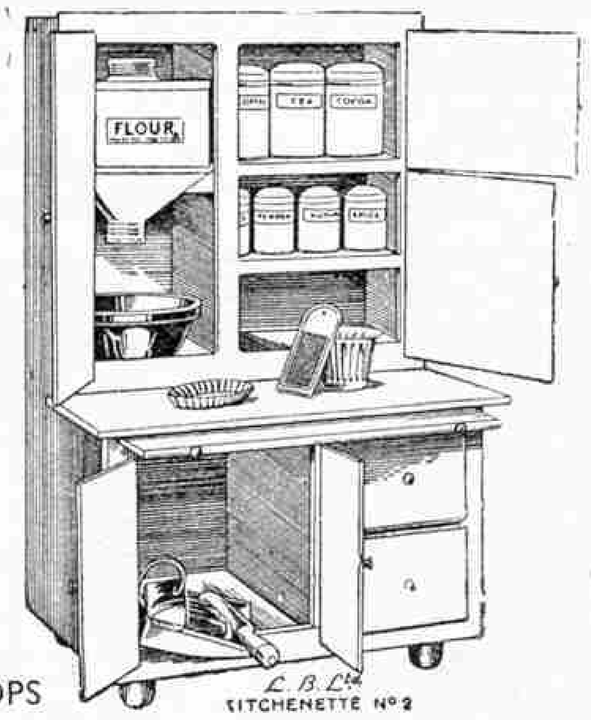


KITCHENETTE No. 2

Fitted with flour sifter, enamelled canisters and two drawers, cupboard, pull-out pastry board, dust-pan and brush, moulds and grater and mixing bowl. Finished in blue, white or pink cellulose enamel.

21/-

Height 23 in.



TRI-ANG TOYS ARE OBTAINABLE FROM ALL GOOD TOY SHOPS

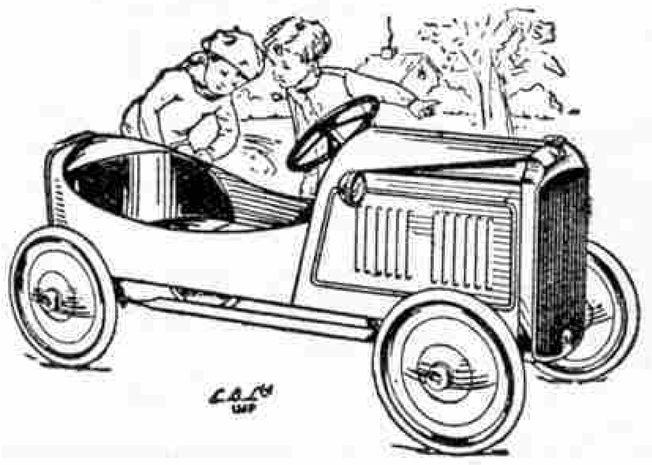
Tri-ang Works, LINES BROS. LTD., London, S.W.19

TRI-ANG TOYS

FAIRYCYCLE No. 2

Tubular frame, cycle enamelled black or blue. 14 in. wheels with 1⅛″ white auto-tread tyres, ball-bearing pedals. Rim brake and coil saddle. Chromium-plated fittings.

39/6



IMP

Steel bodied racing car with adjustable seat. Vauxhall type radiator with plated rim. Steel disc wheels with rubber tyres. Stove enamelled finish. Length 43 ins.

25/-

DOLL'S PRAM 20/C

Tastefully moulded steel panels. Flexible strap-hung springs. 1⅛″ jointless sponge rubber tyres. Rubber duck hood lined and laced. **Chromium plated handles, wheel rims and hubs.**

37/6

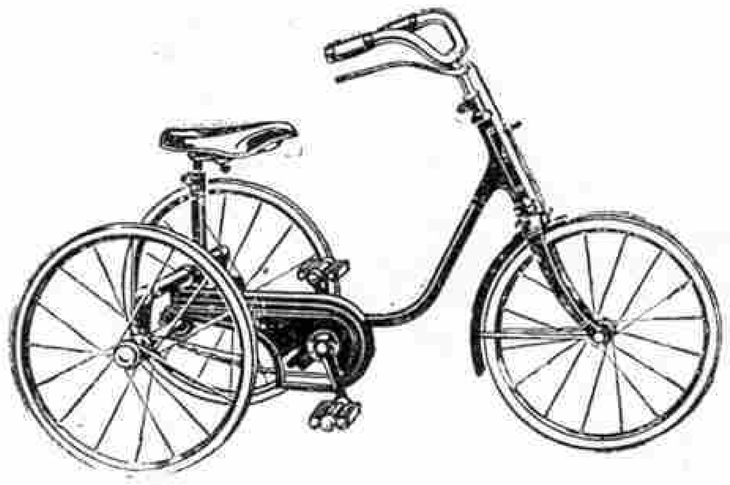
Length of Body, 20 ins.

PEDALKAR 4SS

Pressed steel seat with folding back rest. Tangent spoke wheels and 1⅛″ jointless sponge rubber tyres. Nickel plated handlebars and cranks.

15/-

Length, 27 ins.

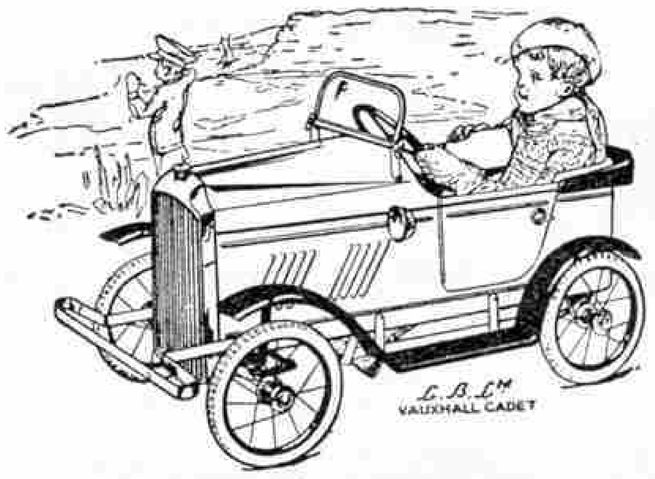


TRIKE No. 6

Chain driven tricycle with free wheel and roller chain. Sponge rubber tyres. Front wheel brake. Finished in black cycle enamel, lined. Adjustable saddle.

39/6

Safe and Strong.



VAUXHALL CADET

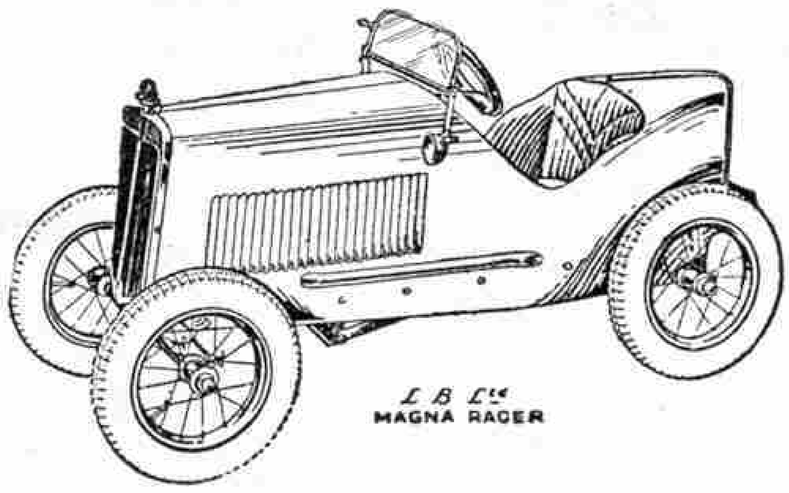
Light touring car with opening side door. Plated tubular bumper and 1½″ sponge rubber tyres. Complete with two plated lamps and petrol and oil tins. Steel body, stove enamelled. Length 35 ins.

39/6

MAGNA RACER

Modern Sports type car with polished aluminium body. Double crank drive and ball bearing back axle. Tubular front axle. Adjustable windscreen. 2¼″ Dunlop pneumatic tyres. Length 52 ins.

92/6



DOLL'S PRAM 22/UT

Low Mounting Type.

Attractive design moulded on steel body. Black levers with white rubber grip. 1⅜″ jointless sponge rubber tyres and two pairs of mudguards. Laced hood and apron with storm flap. Body 22 ins. long.

35/6

TRI-ANG TOYS AT ALL GOOD STORES & TOYSHOPS

LINES BROS. LTD. LONDON BR 05 ENGLAND

Tri-ang Works, LINES BROS. LTD., London, S.W.19

"THREE LITTLE PIGS" MAGIC LANTERN OUTFITS

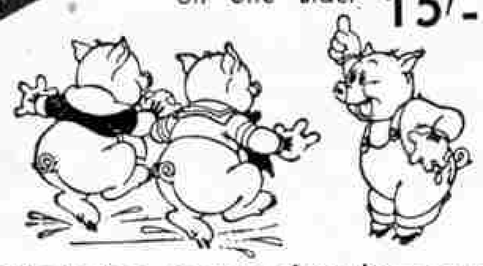
with 24 coloured picture slides from the famous WALT DISNEY Film

Magic Lantern Outfit Including electric Magic Lantern operated from a pocket battery. Gives a beautiful picture very clear and in lovely colours. Lantern is made of metal and fitted with a diffused lamp. Complete with set of 24 "Three Little Pigs" beautifully coloured picture slides and reading. **7/6**

"Mickey Mouse" and "Three Little Pigs" Combined Magic Lantern Outfit. Contains complete Lantern with spare battery and lamp. Presentation set of 11 Mickey Mouse Movie stories of 8 picture slides each. Set of 24 "Three Little Pigs" coloured picture slides. All in strong dark blue fibre attache case. Packed in picture carton with showing screen on one side. **15/-**

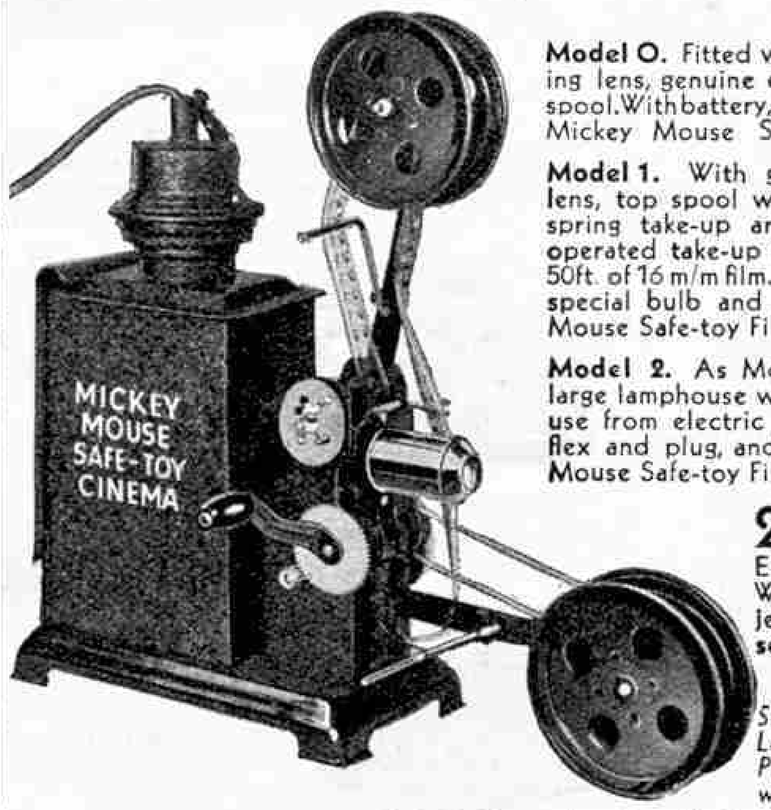
"Three Little Pigs" Coloured Picture Slides.

Per set of 24 pictures with story printed in large type **2/6**



MICKEY MOUSE SAFE-TOY CINEMAS

The ideal winter toy, giving a beautiful bright and clear picture. Fitted with a genuine cut-off shutter as in the expensive machines. A feature never incorporated in toy cinemas before. You will find no difficulty in operating these toy cinemas.



Model O. Fitted with good quality focusing lens, genuine cut-off shutter and top spool. With battery, bulb and three Mickey Mouse Safe-toy Films **12/6**

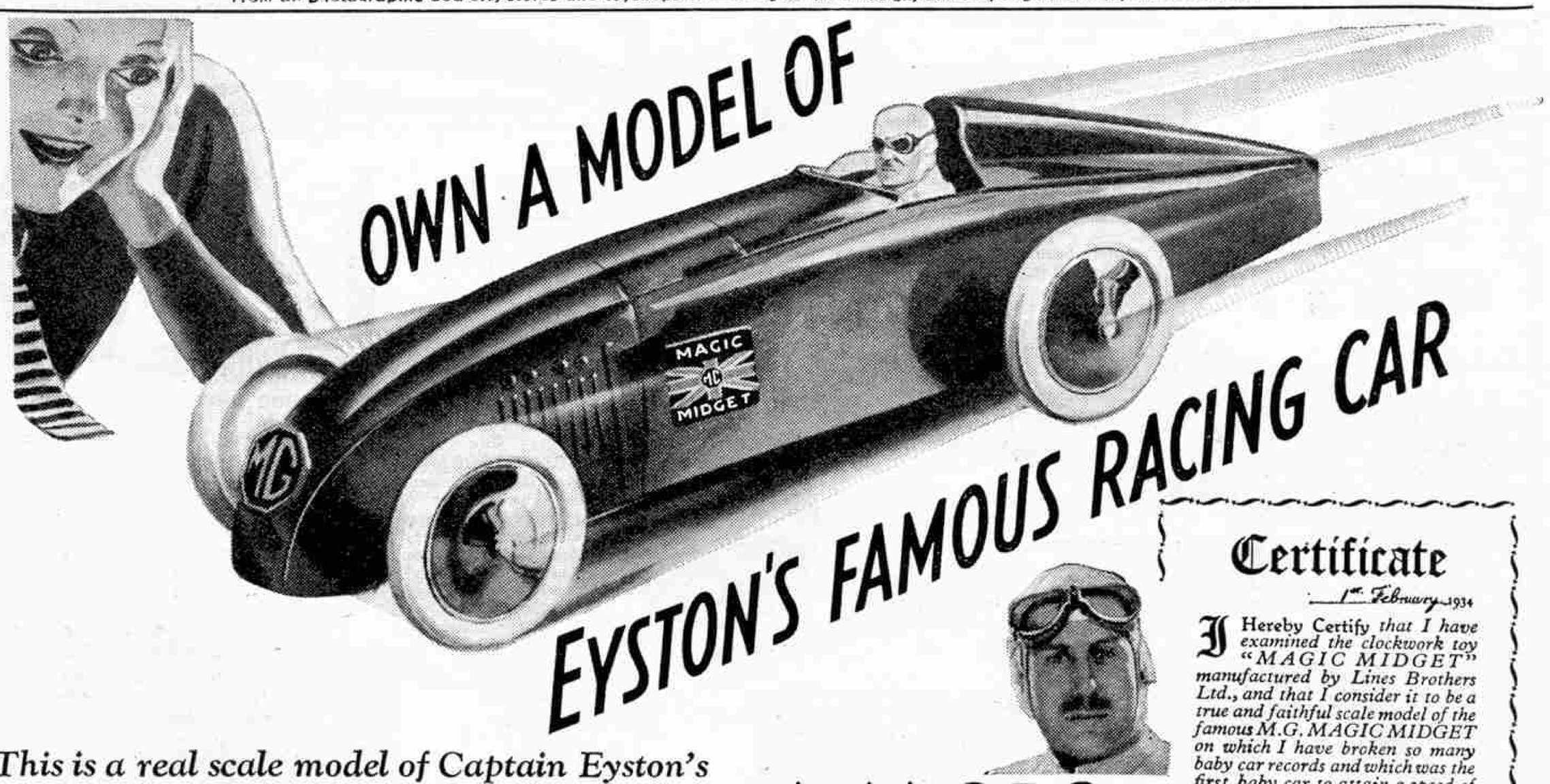
Model 1. With good quality focusing lens, top spool with rewind handle and spring take-up arm, and bottom spring operated take-up arm for running up to 50ft. of 16 m/m film. Complete with battery, special bulb and five Mickey Mouse Safe-toy Films - - - **17/6**

Model 2. As Model 1, but fitted with large lamphouse with adjustable cowl for use from electric mains. Complete with flex and plug, and five Mickey Mouse Safe-toy Films - - - **21/-**

20 MICKEY MOUSE SAFE-TOY FILMS Extracts from famous Walt Disney Films. 20 subjects in 4 series. Per series of five films **2/6** Per film **6d.**

Slides and Films British. Lanterns & Cinemas Foreign Produced by arrangement with Walt Disney Mickey Mouse Ltd.

From all photographic dealers, stores and toyshops or catalogues from Ensign, Limited, High Holborn, London, W.C.1



Certificate

1st February 1934

I Hereby Certify *that I have examined the clockwork toy "MAGIC MIDGET" manufactured by Lines Brothers Ltd., and that I consider it to be a true and faithful scale model of the famous M.G. MAGIC MIDGET on which I have broken so many baby car records and which was the first baby car to attain a speed of two miles a minute.*

(Signed) George Eyston

This is a real scale model of Captain Eyston's record-breaking M.G. Magic Midget—the first Baby car to do over 120 m.p.h.: Eyston, himself, has certified it to be a perfect replica. It looks a speedy car—and it is. Try the Magic Midget out against your friends' racers.

The Magic Midget has an all-steel body with a powerful clockwork motor, rubber wheels with polished aluminium disc. Length 16 in. Price **10/6**

MAGIC MIDGET

Made by the makers of TRI-ANG TOYS under the Supervision of Capt. G. Eyston

See the Magic Midget at your toyshop.

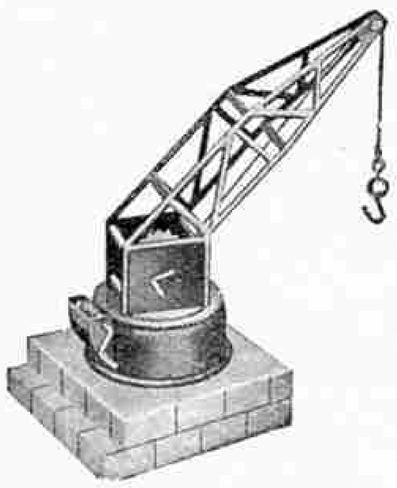
LINES BROS. LTD., TRI-ANG WORKS, LONDON, S.W.19

HORNBY SERIES

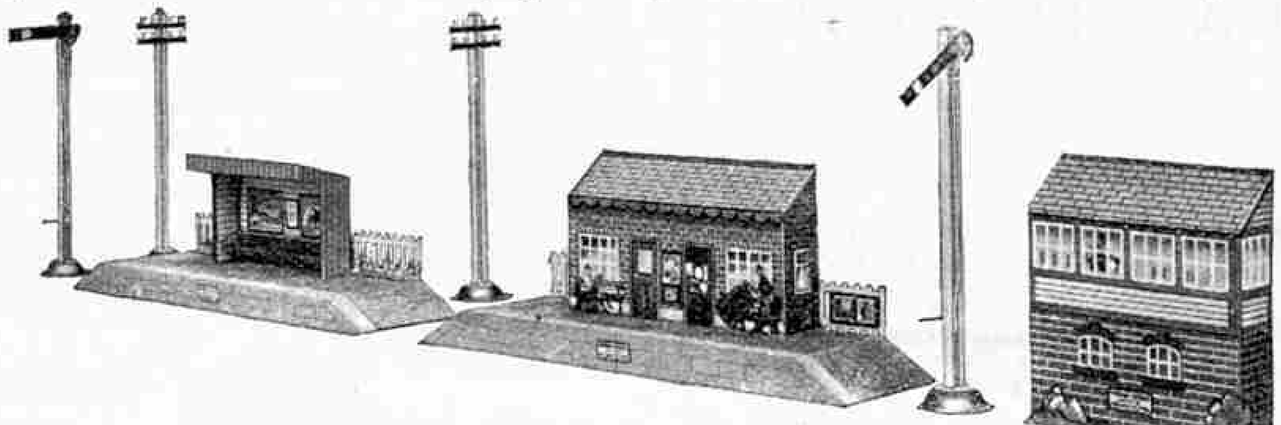
HORNBY ACCESSORIES

GAUGE O

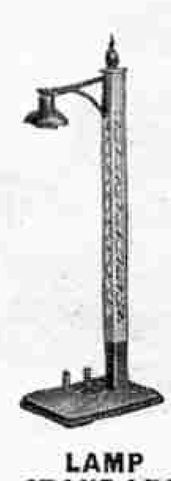
There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.



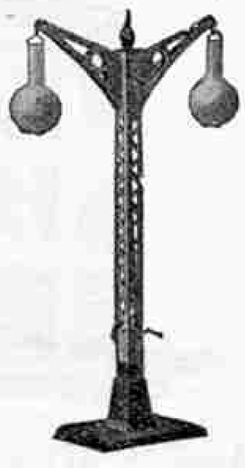
PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price **3/11**



M STATION SET (7 pieces). Price **3/-** complete
The components of the M Station Set may be purchased separately.
M Signal Box. Price **4**d. M Signal. Price **4**d. M Station. Price **1/-**. M Telegraph Pole No. 1. Price **3**d. M Wayside Station. Price **9**d.

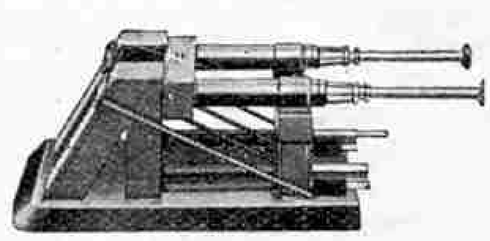


LAMP STANDARD No. 1E ELECTRICAL
(Single, as illustrated).
Price **3/6**

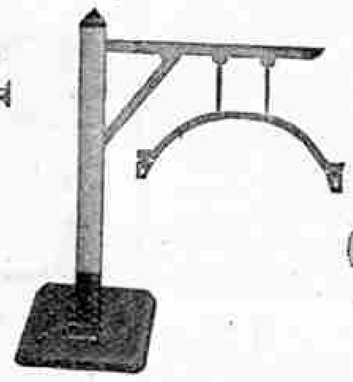


LAMP STANDARD No. 1
(Single).
Price **3/6**

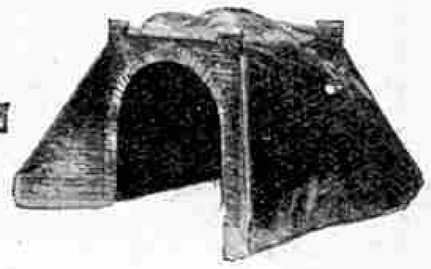
STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price **6**d.



BUFFER STOPS No. 2
(Hydraulic type.) Price **5/6**



LOADING GAUGE
(Illustrated).
Price **2/3**
M LOADING GAUGE
Price **1/-**

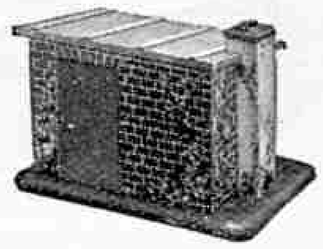


TUNNEL (Metal)
(As illustrated).
Price **3/11**

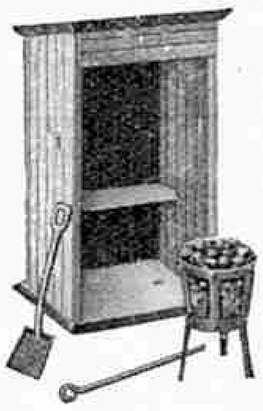
LAMP STANDARD No. 2E ELECTRICAL
(Double).
Price **4/3**

LAMP STANDARD No. 2
(Double, as illustrated).
Price **4/6**

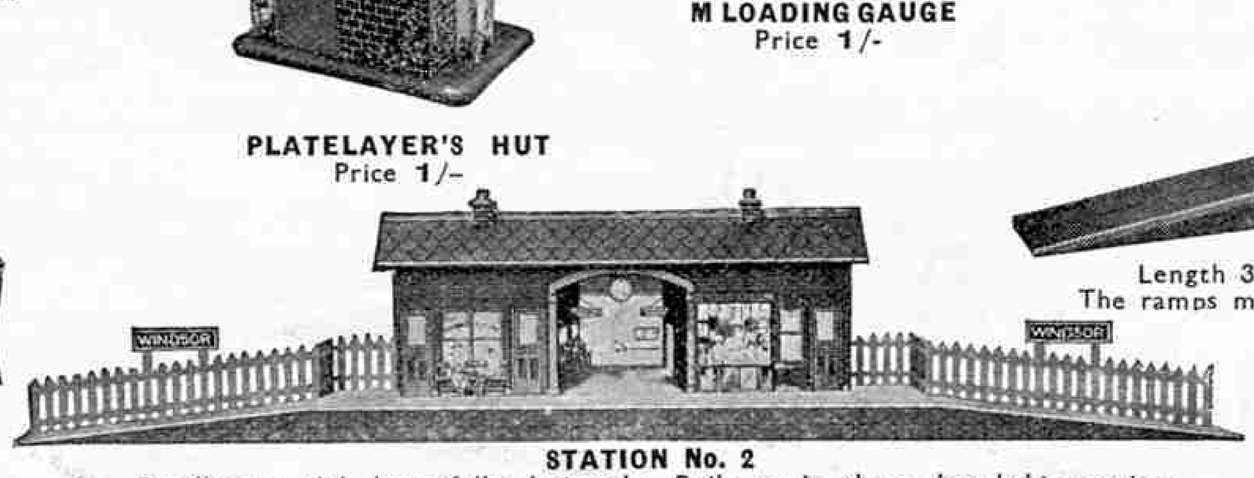
POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price **6**d.
No. 2 Series. Packet of 51 ,, **6**d.



PLATELAYER'S HUT
Price **1/-**

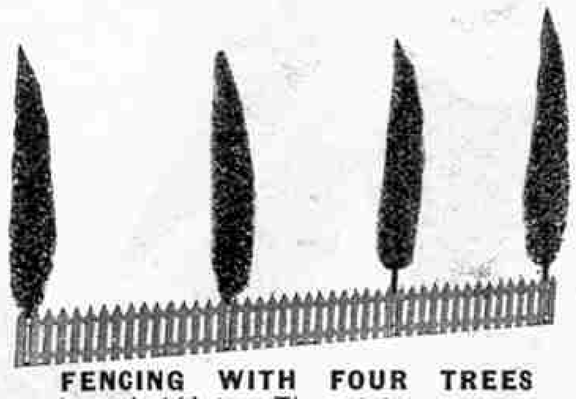


RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker. Price **1/3**



STATION No. 2
Excellent model, beautifully designed. Built up in three detachable sections.
Length 2 ft. 9 in., breadth 6 in., height 7 in. Price **9/6**

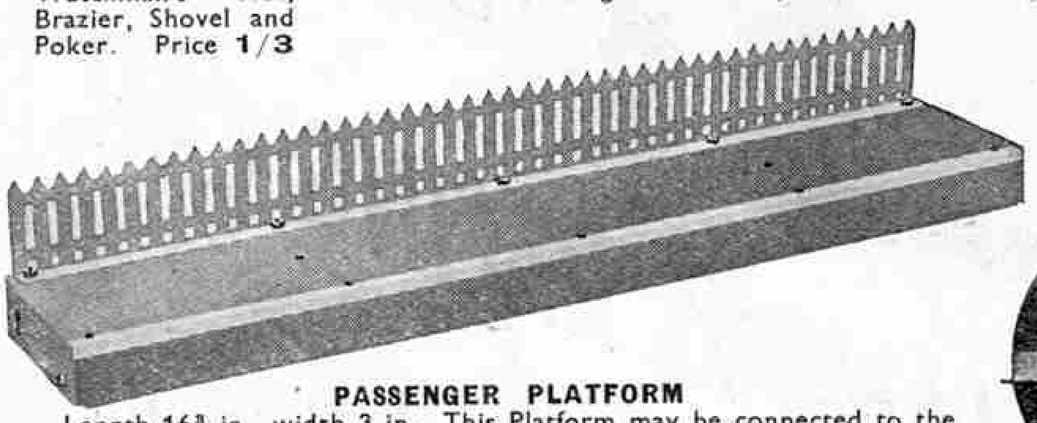
ISLAND PLATFORM
Length 32¼ in., height 6¾ in., width 3 in. Price **6/6**
The ramps may be purchased separately. Price, per pair, **1/9**



FENCING WITH FOUR TREES
Length 16½ in. The miniature trees are detachable. Price, per pair, **2/6**

TREES

Trees with Stands, assorted	per doz.	**3/-**
Trees, Oak ...	,,	**2/6**
Trees, Poplar ...	,,	**2/-**
Stands for Trees	,,	**1/-**
Hedging on Base (10½ in. lengths)	,,	**3/-**

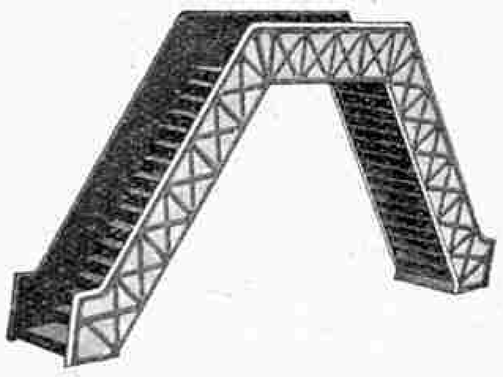


PASSENGER PLATFORM
Length 16¾ in., width 3 in. This Platform may be connected to the main Station or used separately ... ... Price **2/6**
The white Paled Fencing may be purchased separately. Price per length **6**d.

TURNTABLE No. 2
Price **3/9**

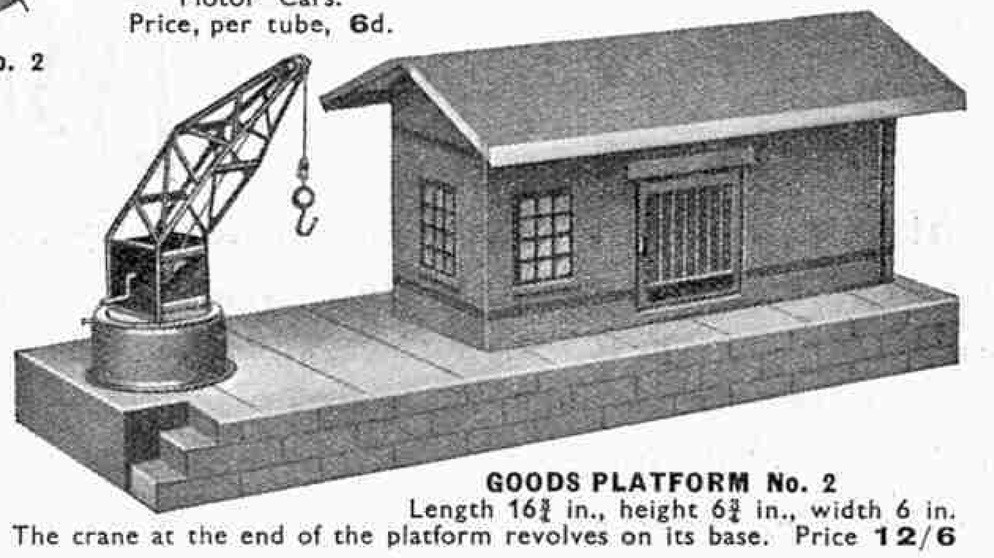
LUBRICATING OIL
Specially prepared for Hornby Trains, Rolling Stock and Accessories.
Price, per bottle, **6**d.

GRAPHITE GREASE
An ideal lubricant for the springs of Hornby Locomotives and Hornby Speed Boats, Meccano and Aero Clockwork Motors, and Meccano Motor Cars.
Price, per tube, **6**d.



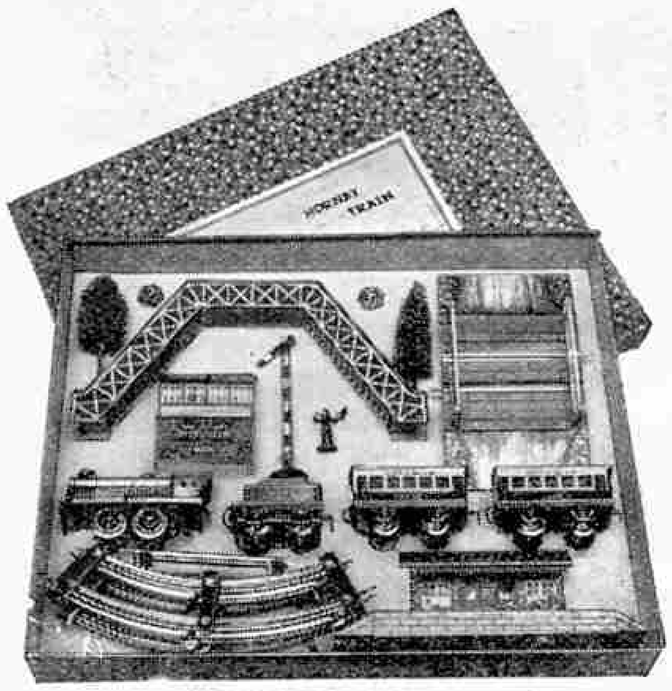
M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price **1/3**

No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6in. Price **7/6**

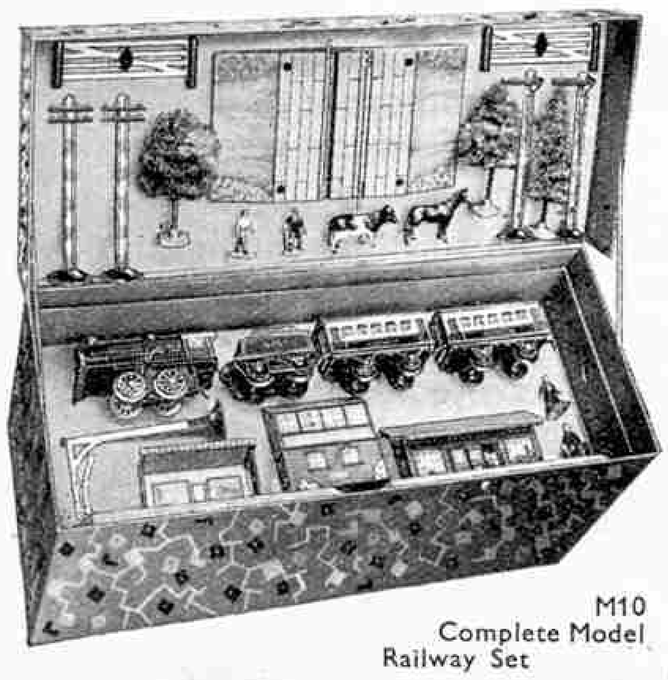


GOODS PLATFORM No. 2
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price **12/6**

M8 Complete Model Railway Set



M9 Complete Model Railway Set



M10
Complete Model
Railway Set

THE NEW

HORNBY COMPLETE MODEL RAILWAY SETS

Contain everything that is necessary for a complete miniature railway

PRICES FROM 9/6 TO 25/-

The Complete Model Railway Sets illustrated on this page are interesting additions to the popular Hornby M range. Each Set includes an efficient clockwork Locomotive, various items of Rolling Stock, a Set of Rails, and Lineside Accessories.

All you have to do is to unpack the box, lay out the rails and accessories as shown in the illustration provided, place the locomotive and coaches or wagons on the track, and commence operating your own railway immediately. It's great fun!

M8 Complete Model Railway

This Model Railway Set consists of a non-reversing Locomotive, Tender and two Goods Wagons, Wayside Station, Footbridge, Signal, Signal Cabin, two Poplar Trees with Stands, Tunnel and Set of Rails. The complete Set is packed in a strong carton, as illustrated. Price 9/6

M10 Complete Model Railway

This is a more comprehensive Railway Set, consisting of a non-reversing Locomotive, with a reliable mechanism that can be braked from the track, Tender, two Pullman Coaches, Set of Rails, Footbridge, two Stations, Signal Cabin, two Telegraph Poles, two Signals, Loading Gauge, Tunnel, Cutting, Level Crossing, three Trees and six die-cast Figures.

The complete Set is attractively packed in a special cabinet, as illustrated. Price 19/6

M9 Complete Model Railway

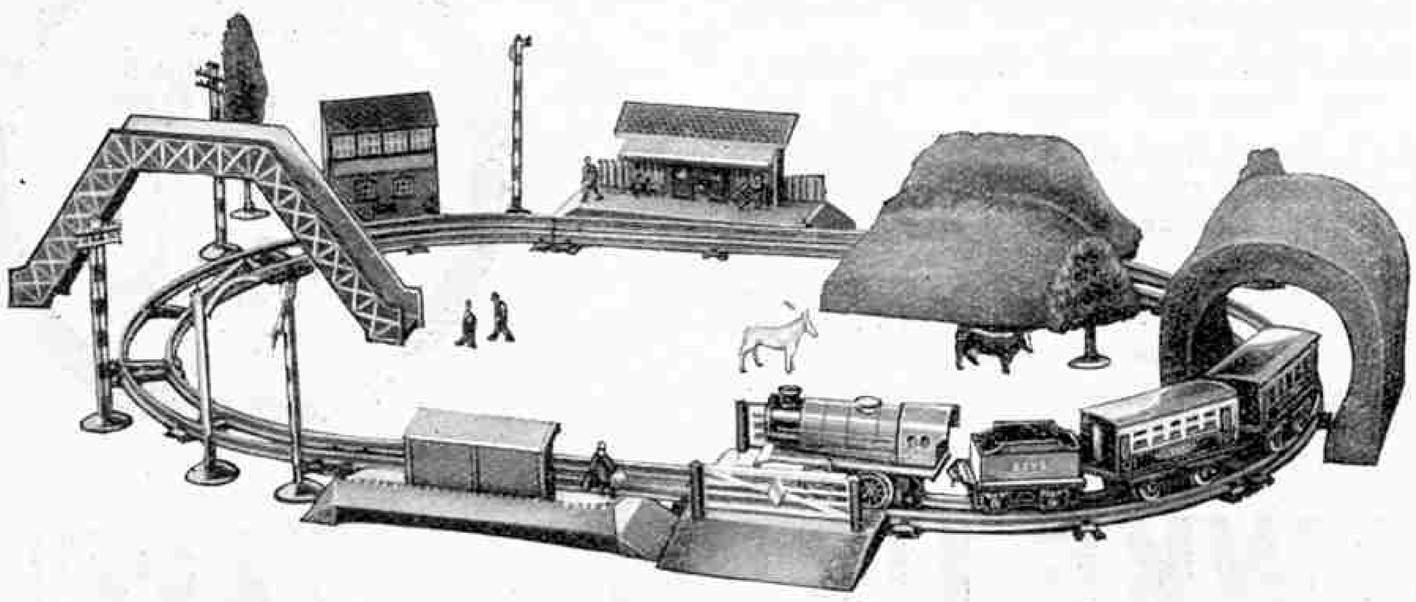
The M9 Complete Model Railway Set contains a comprehensive selection of material, consisting of an efficient non-reversing Locomotive, which may be braked from the track, Tender and two Passenger Coaches, Signal, Station, Footbridge, Signal Cabin, Level Crossing, Guard, two Trees with Stands, two Hikers, and Set of Rails. The complete Set is packed in a strong carton, as illustrated. Price 12/6

M11 Complete Model Railway

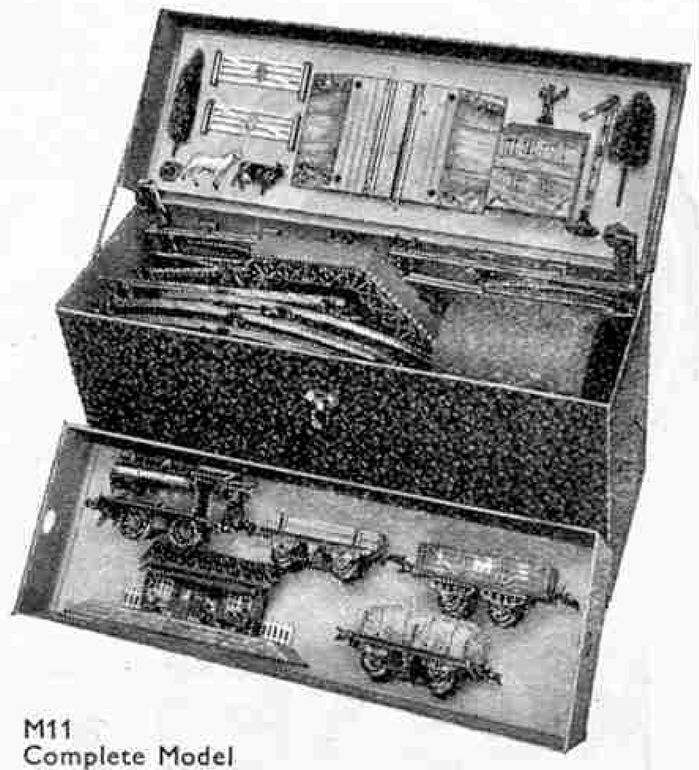
This complete Model Railway Set is the most popular and the most comprehensive in the series. It consists of a reversing Tank Locomotive, Fibre Wagon, Timber Wagon, Open Wagon, Tunnel, Station, Signal, Level Crossing, Signal Cabin, Footbridge, one Cow, one Horse, two Trees with Stands, Guard, and Set of Rails. The complete Set is attractively packed in special cabinet, as illustrated. Price 25/–

Obtainable from all Meccano Dealers

Manufactured by
MECCANO LIMITED
BINNS RD., LIVERPOOL 13

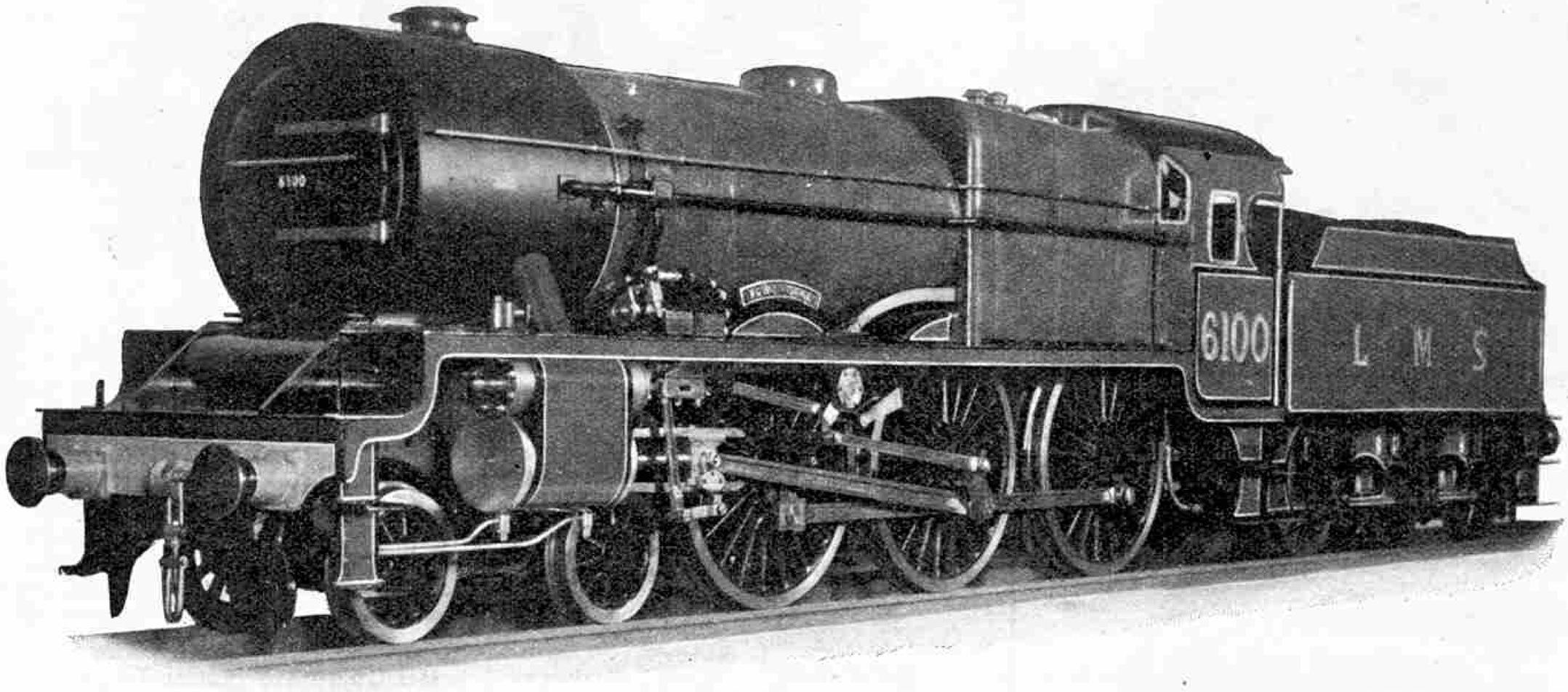


This illustration shows a suitable arrangement of the M10 Complete Model Railway Set



M11
Complete Model
Railway Set

SEE THIS MASTERPIECE!



● THIS IS THE "ROYAL SCOT," the largest model of this famous engine we have built. It is over 8 feet long, 1½ inch scale and 7¼ inch gauge, burns solid fuel just like the real engine, has piston valve cylinders with full Walschaert's valve gear, mechanical lubrication, steam brakes and will haul 20 people!

A wonderful model! Wouldn't you like one? Perhaps it would be rather a gigantic present to have in the house, but you can have an equally accurate and fascinating working model of the "ROYAL SCOT" in smaller sizes. We make them in 2½ and 1¾ inch (Gauge 1) in high pressure steam, at prices from £32, and also in the most popular of all indoor gauges, No. "O," price 75/– clockwork and electric d.c. and 78/6 electric a.c.

HERE IS A RANGE which no other firm can equal, and the same applies to all our productions. Look on the opposite page. Think of the work given to hundreds of British employees in producing this wonderful array of models—railways, engines, ships—only a few of which we can display here, true to scale, reliable, realistic and good value.

Yet all these were the outcome of a boy's hobby. Great things may come from small beginnings, and Mr. W. J. Bassett-Lowke, when he was a young apprentice in his father's works can hardly have dreamed that his hobby would have such far-reaching results.

In addition to locomotives and rolling stock we have a fascinating Catalogue devoted to Stationary Engines—fittings, parts, boilers, castings and everything for the Model Engineer, and then there are ships—the lure of the sea, the lake and the river—sailing yachts, motor boats and scale model craft. Maybe you would like to build your own craft. We produce over 10,000 different ships fittings and a full description of them is given in our Ships Catalogue.

When choosing your Christmas present you should have these three lists by you. Let the oldest established model firm in England send something to you for December 25th.

- **A.17.** Model Railways and Accessories.
- **B.17.** Model Stationary Engines, Castings, Parts, and Fittings.
- **S.17.** Model Ships of all kinds, and scale Ships Fittings.

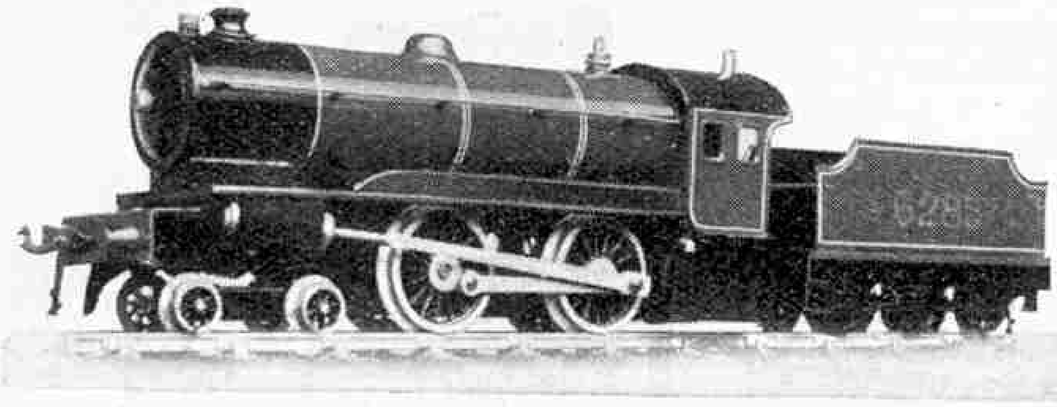
Price 6d. each section post free.

We also have a new FREE FOLDER of our popular Railway and Ships, "NORTHAMPTON, NEXT STOP!" which will be sent to those interested.

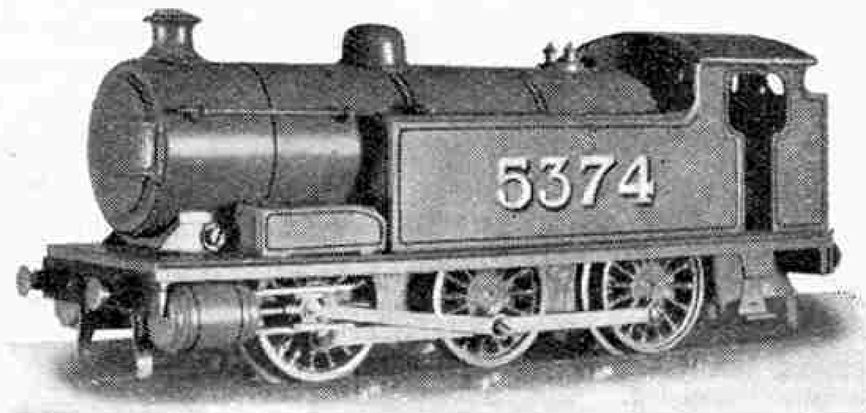
There is a special department at our Holborn Branch devoted solely to high-class toys—aeroplanes, motor cars, constructional sets, etc. Pay a visit this month to our fascinating shop.

BASSETT-LOWKE LTD NORTHAMPTON
MAKERS OF ENGINEERING MODELS

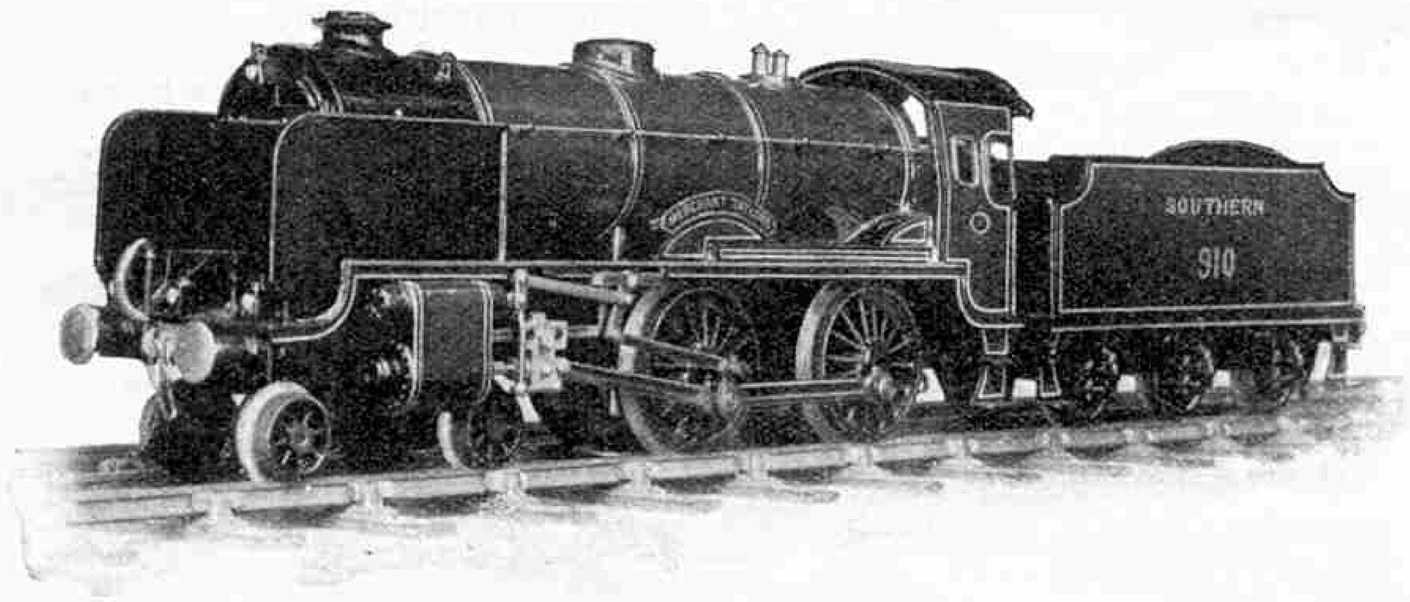
HIGH SPOTS from Bassett-Lowke's Works!



"ENTERPRISE" The most powerful Gauge "O" Steam Locomotive ever produced commercially. Under test has hauled five long bogie coaches for 50 minutes non-stop, covering 1¾ miles. In green, black and red. Add one to your stud. Realistic and easy to handle and only **50/–.**



No. 5374 Here is a popular Tank Locomotive among model railway owners. 6-coupled, powerful and smart, with all-British clockwork mechanism. Price **42/–.** Electric d.c. and a.c. **45/–.**



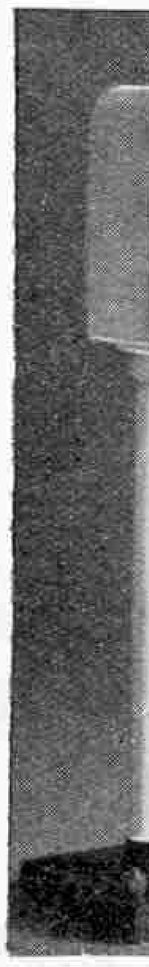
Southern Railway "Schools" Class Locomotive, No. 110

"Merchant Taylors"

Comprehensive in external detail, with special smoke deflectors and correct lining colouring and lettering. Fitted with powerful clockwork mechanism **£4 10s.**, with d.c. standard permag motor and a.c. electric motor (foreign made), **5** guineas. A really tip-top model for the money.

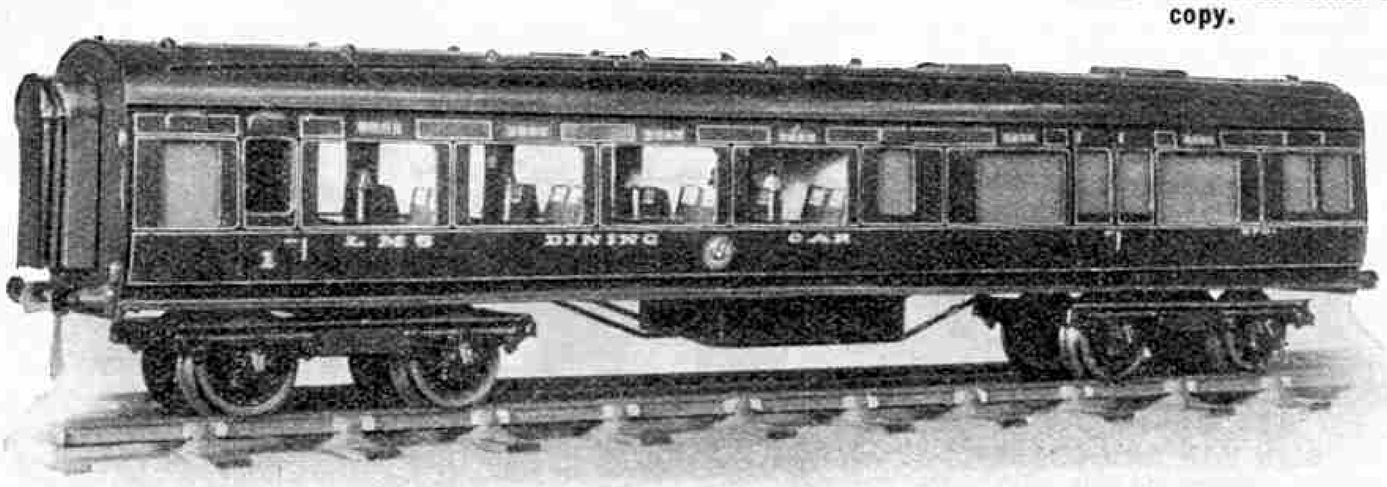
There are scores more of these fine locomotives which we cannot possibly illustrate here—the handsome green "FLYING SCOTSMAN," clockwork and electric, 4 guineas, and the world famous "ROYAL SCOT," in Gauge "O," "PRINCESS ELIZABETH," at 25s., clockwork.

Some of these are described in our new free booklet of trains and boats. Send for your copy.



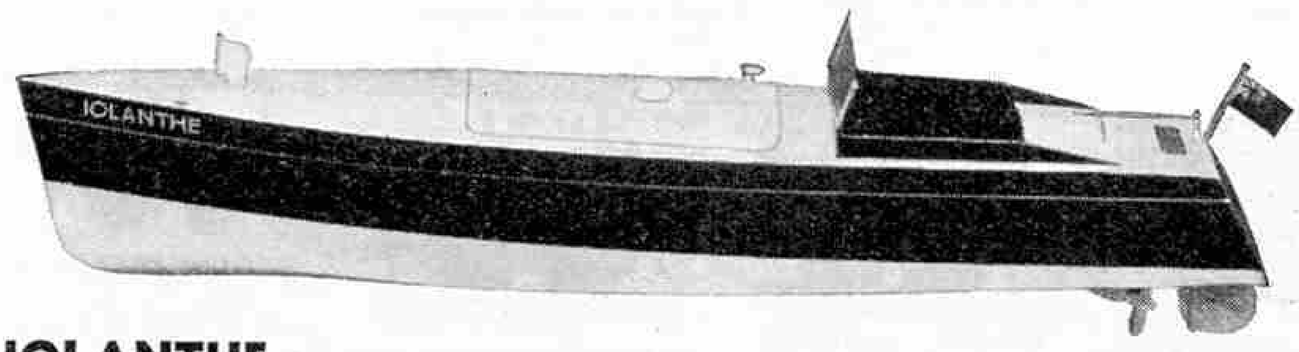
SIGNAL

New Colour Light Series.
Two Aspect, height 5½ in. Price **5/–.**
Three Aspect, height 5½ in. Price **7/6**
Also automatic series of signals in gauge "O" designed by Henry Greenly. Price **9/–** each, two aspect ready wired.



DINING CAR

New series of Scale Model Coaches in Gauge "O". You want something better for your line? Here it is. A range of all steel coaches, hand-painted, accurately modelled, fitted with our special pattern bogies, and with cast iron wheels in the following patterns:
L.M.S., S.R. and L.N.E.R. in 1st and 3rd class, and with brake end. G.W.R. side corridor type coach with bow-end, and with brake end.
All one price **37/6.** L.M.S. Dining Car illustrated **48/–.**



IOLANTHE One of the many magnificent boats described in the BASSETT-LOWKE Ships Catalogue S.17. Under test covered an 85 ft. pond in 32 seconds from a standing start.

In clockwork and electric, price **35/–**
Can be also supplied with special detachable cabin, price **£2 10s.**

You can get these and many other BASSETT-LOWKE specialities from our agents in the following towns:

EDINBURGH.—Anderson's, 105, Princes Street.
LIVERPOOL.—C. Lucas, 17, Houghton Street,
DUBLIN.—The Model Engineer's Suppliers, 20, Wicklow Street.
BIRMINGHAM.—Barnby's, 39, Great Western Arcade.
SCARBOROUGH.—The Sun-Ray Photo Co., 28, Newborough.
NOTTINGHAM.—Photo Supplies Ltd., 7, Pelham Street.
GLASGOW.—R. Wylie Hill & Co. Ltd., 20, Buchanan Street, C.1.
SHEFFIELD.—Wilson Gumpert & Co. Ltd., 57, Fargate.
CARDIFF.—R. W. Duck & Sons Ltd., St. John's Square.
BRADFORD.—Brown, Muff & Co.

We also supply them direct, spick and span, from our works at Northampton or from our
LONDON SHOP, 112, High Holborn, W.C.1, or at **MANCHESTER BRANCH, 28, Corporation Street.**

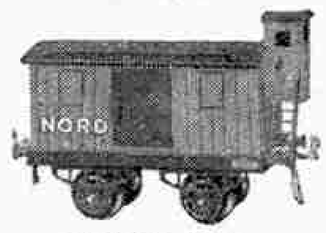
BASSETT-LOWKE LTD. —— NORTHAMPTON

HORNBY ROLLING STOCK

Hornby Rolling Stock includes almost every type in use on the big railways, and a selection of the splendid range available is illustrated on this page. The various items are modelled on realistic lines, strongly built and beautifully finished.

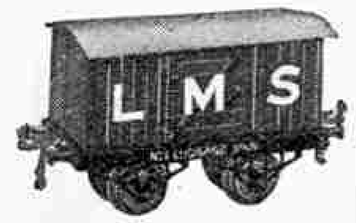
Ask your dealer to show you the full range of Hornby Rolling Stock.

PETROL TANK WAGON "PRATTS"
Finished in buff. Price 2/–

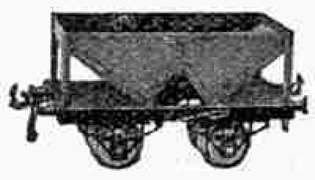


BRAKE VAN (French Type)
Lettered "NORD." Beautifully finished in colours. Opening doors. Price 4/–

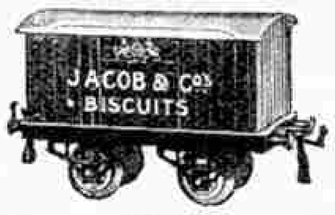
CARR'S BISCUIT VAN
Finished in blue, with opening doors. Price 2/9



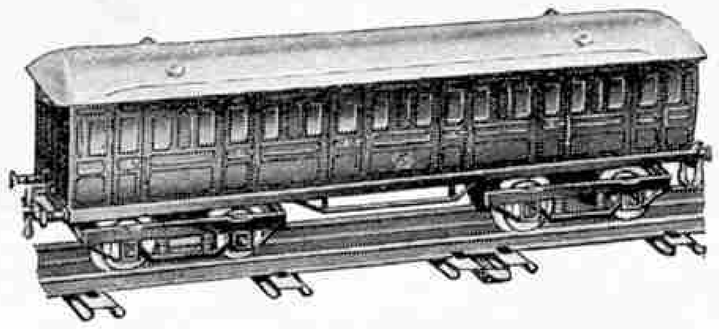
***LUGGAGE VAN No. 1**
With opening doors. Price 2/9



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price 3/6

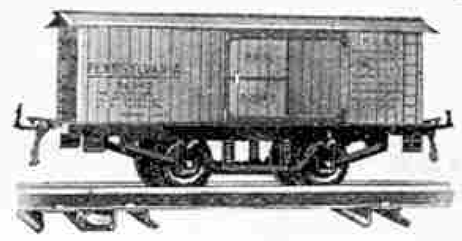


JACOB'S BISCUIT VAN
Finished in brown, with opening doors. Price 2/9



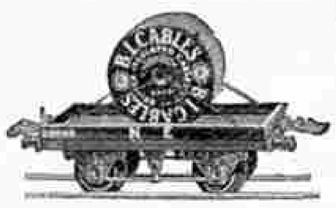
COACH, METROPOLITAN C
As supplied with Metropolitan Clockwork Train Set ... ... Price 7/6

COACH, METROPOLITAN LV
As supplied with E36 Metropolitan Electric Train Set ... Price 11/6



BOX CAR, AMERICAN TYPE
This is a model of the type in use on American railways. Price 2/6

PETROL TANK WAGON "REDLINE-GLICO"
Finished in blue and red. Price 2/–

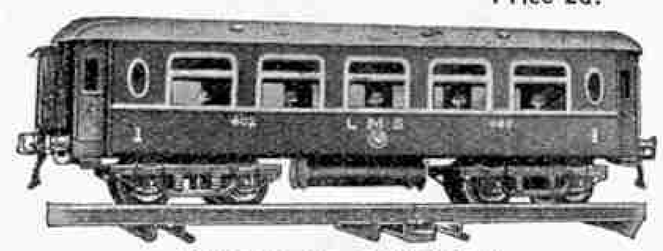


***FLAT TRUCK**
Without Cable Drum. Price 1/6
Complete with Cable Drum ... Price 1/9

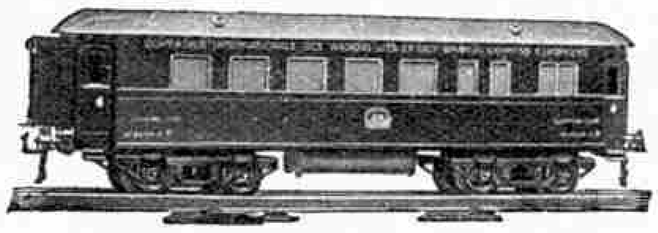
CABLE DRUM
(British Insulated Cables Ltd.) ... Price 3d.

TIMBER WAGON No. 1
Beautifully finished. Price 1/6

TROLLEY WAGON
Finished in red and green. Suitable for 2-ft. radius rails only ... ... Price 3/11



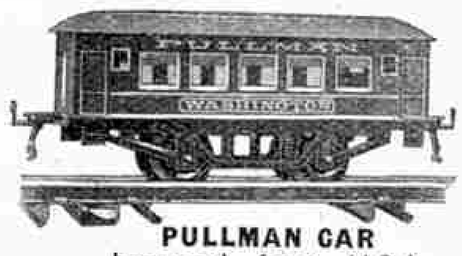
COACH, No. 2 SALOON
Realistic model. Beautifully finished in correct colours of L.M.S.R. or L.N.E.R. Saloon Coaches. Suitable for 2-ft. radius rails only ... Price 9/6



COACH, RIVIERA "BLUE"
"Dining" or "Sleeping"
This is a beautiful model, substantially built and well finished. Suitable for 2-ft. radius rails only. Price 12/6

COACH, CONTINENTAL "MITROPA" No. 3
Similar in design to the above. Beautifully finished in red with white roof, and lettered "Mitropa" in gold ... ... Price 12/6

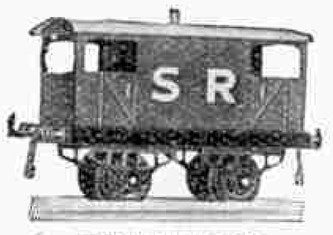
TIMBER WAGON No. 2
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only ... ... Price 2/6



PULLMAN CAR
Imported from U.S.A. Product of Meccano factories.

American Type (as illustrated). Yellow or green, with orange or bright red roof. Lettered "Washington" or "Madison" ... Price 1/6

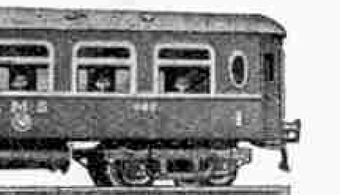
Continental Type. Red with white roof. Lettered "Mitropa" No. O. Price 1/6



BRAKE VAN
Finished in brown, with opening doors. Obtainable with N.E. or S.R. lettering. Price 2/11

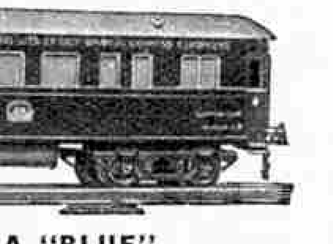
GUARD'S VAN
In colours to represent L.M.S.R., L.N.E.R., G.W.R. or S.R. Price 2/6

***WAGON, HORNBY No. O** ... Price 1/6
***WAGON, HORNBY No. 1** (illustrated) Price 1/9



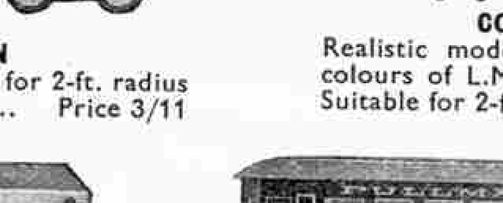
LUMBER WAGON No. 1
Fitted with bolsters and stanchions. Price 1/6

SNOW PLOUGH
With revolving plough. Price 3/9



SIDE TIPPING WAGON
Lettered "Robert Hudson Ltd." Price 2/–

TANK CAR, AMERICAN TYPE
Model of the type of oil tank car used in America ... Price 1/9



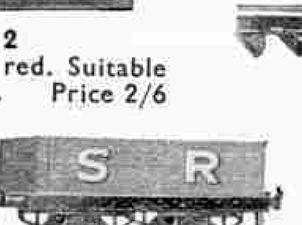
***LUGGAGE VAN No. 2**
Fitted with double doors. Suitable for 2-ft. radius rails only. Price 4/6

***CATTLE TRUCK No. 2**
Fitted with double doors. Suitable for 2-ft. radius rails only ... Price 4/6

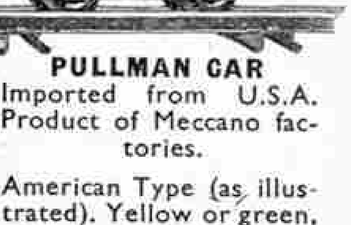
CABOOSE, AMERICAN TYPE
Modelled on the type of brake van used on American railways. Price 2/6

WAGON, COVERED (French Type)
This wagon is fitted with frame and sheet. Lettered "NORD" ... Price 2/6

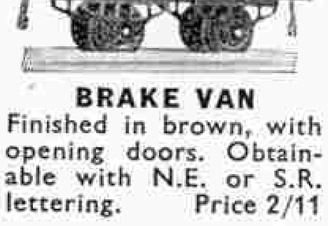
MILK TANK WAGON "UNITED DAIRIES"
Finished in blue and white. Price 4/6



CEMENT WAGON
The door at the top opens. Finished in bright red. Price 2/6



CHOCOLATE VAN "CADBURY'S"
Beautifully finished in blue with white roof. Price 2/9



CRANE TRUCK
Finished in brown and blue. Price 2/11

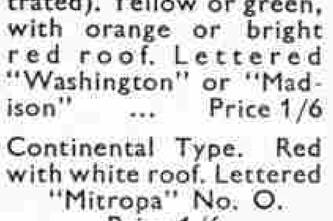
BITUMEN TANK WAGON "COLAS"
Finished in blue Price 3/6

BARREL WAGON
This is a model of a type of wagon used in France and other European countries. Price 2/6

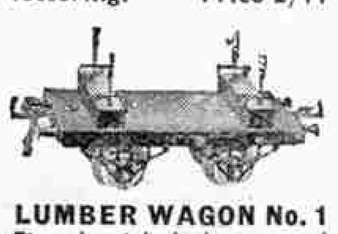
WAGON (French Type)
Lettered "NORD." Price 3/3

WINE WAGON DOUBLE BARREL
This model represents the French double-barrel type of Wine Wagon. Beautiful finish. Price 4/6

WINE WAGON SINGLE BARREL
Price 3/6



ROTARY TIPPING WAGON No. 0
Price 1/6



ROTARY TIPPING WAGON No. 1
Finished in blue and pale gold ... ... Price 2/6

In L.M.S.R., L.N.E.R., G.W.R., or S.R. lettering.

MECCANO LTD. — BINNS ROAD — LIVERPOOL 13

Boys! Play these two thrilling games

–then say (if you can) which is the more exciting!

First—that seasoned favourite—Corinthian Bagatelle. Perhaps you already know it—probably you played it at that party that sticks in your mind as having been such awfully good fun. May-be, though, it was round at your friend's house one riotous evening?

Anyway—if you haven't tried Corinthian Bagatelle yet, there's a treat in store for you!

Think of the most exciting indoor game you ever played—multiply its thrills by ten—add a load of laughter—take away the game you first thought of—and the answer's CORINTHIAN! "Dad"—say firmly—"we must have a Board in the house!" (But tell him to look for name-plate Corinthian. None genuine without.) Prices range from 10/– upwards.

CORINTHIAN *Bagatelle*

Ask your dealer for particulars of the Corinthian £100 competition.

CORINTHIAN TRADE MARK COLUMNS

SKEDDLE

Now—SKEDDLE, a brand new thrill that even the most knowing of your friends won't have tried yet! So new it's almost warm from the factory! So new we think we ought to do the explaining until it's old enough to speak for itself: SKEDDLE comprises an inclined table with skittle and top. The special angle of the table allows the top to S-P-I-N and flip over the skittles at the opposite end. Three "starting zones" are marked out—so the variety of alternative games is legion! If you want to shine in company be first with a SKEDDLE Board. A little quiet practice—and you'll be ready to show 'em just where they get off!

Complete with 2 tops (small and large), 21/–

Prices do not apply in I.F.S.

'ABBEY KEEPDRYE' DART BOARD

The perfect board for club or home. It never splits. No attention needed to keep in perfect condition. No deterioration when out of use.

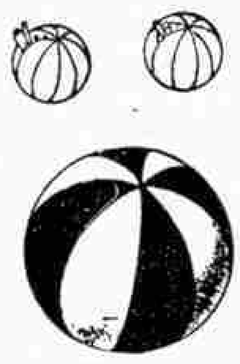
PRICES:

18 in.	double-sided	... ...	12/6
16 in.	,, ,,	... ...	9/–
14 in.	,, ,,	... ...	7/–
18 in.	single-sided	... ...	10/–
16 in.	,, ,,	... ...	7/–
14 in.	,, ,,	... ...	5/6

'Abbey-Adjusta' Dart

A dismountable and deadly accurate dart. Can be easily adjusted to the thrower's technique. 2/6 per set of 3.

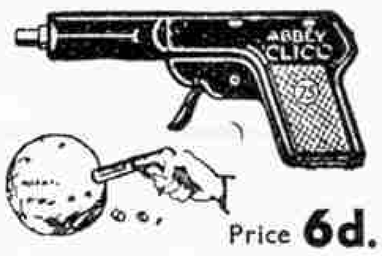
'ABBEY-THYGESEN' BALL



Large as football. Ready for use in 5 seconds. Nothing to tie up. Case of soft all wool cloth. Recommended for 'gym' classes.

5/6 complete.

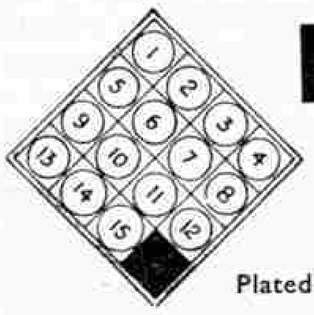
'ABBEY-CLICO' Potato Pistol



Shoots potato 'cartridges' with loud pop. Absolutely safe.

Price **6d.**

FINX



The magic square "15" puzzle. Made entirely of metal. A real brain test.

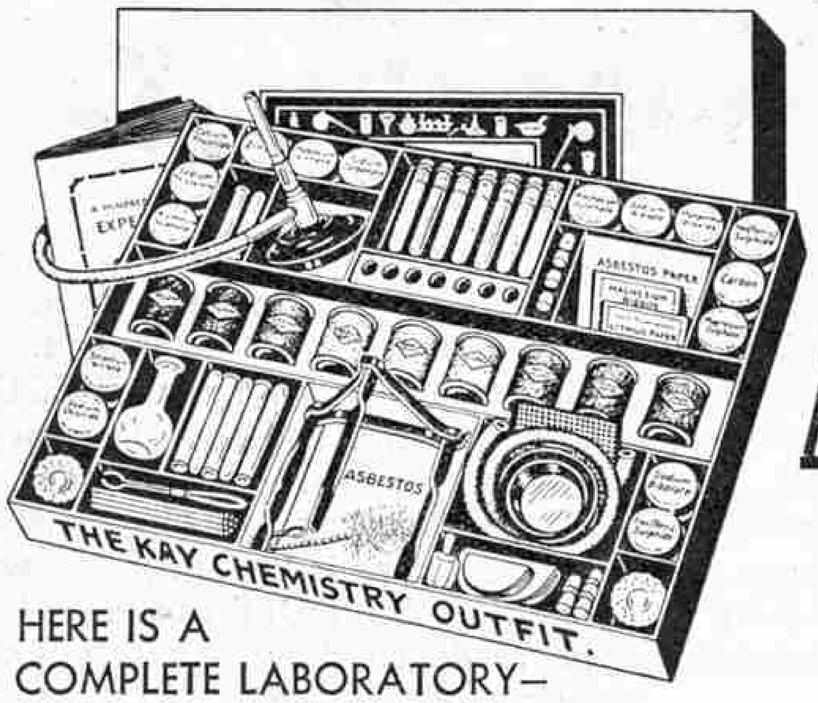
Plated **1/–** Enamel **2/6**

Advertisement of the CORINTHIAN SALES COMPANY, 125, BOROUGH HIGH STREET, S.E.1

FOR THE BOY WHO WILL HAVE THE BEST—

KAY

CHEMISTRY OUTFITS



HERE IS A COMPLETE LABORATORY—

the pride and joy of every Student who is lucky enough to own one! Think of it—34 different chemicals, a Bunsen Burner, Rubber Tubing, a Tripod and Gauze, a Flask, Test Tubes, Glass Tubing, Filters, Test Tube Brush, Asbestos Paper and Millboard, Tray, Scoop, Test Tube Holder, Corks and a splendid book full of instructions and experiments.

10/6 each.

And there are other splendid Outfits, each complete with Bunsen Burner, a good supply of chemicals and apparatus and a book full of instructions and experiments at

2/6, 3/6, 5/–, 7/6, 15/–, 21/–, 35/–, 63/– and **105/–** each.

The outfit illustrated below is the **2/6** one.

185 PRIZES TO BE WON

■

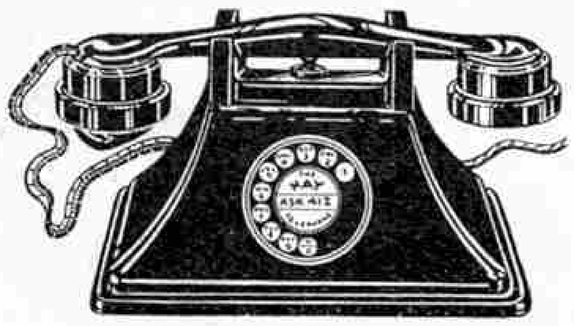
No Entrance Fee

■

Look for the announcement at the bottom of this page

KAY

TELEPHONES



NOT A TOY—
BUT A REAL HOUSE TELEPHONE!

This is indeed a marvellous offer—a pair of real House Telephones, full-sized, one-piece instruments, each 8¾" long—Easy to instal—Automatic calling—Perfect reception—Working off ordinary pocket-lamp batteries!

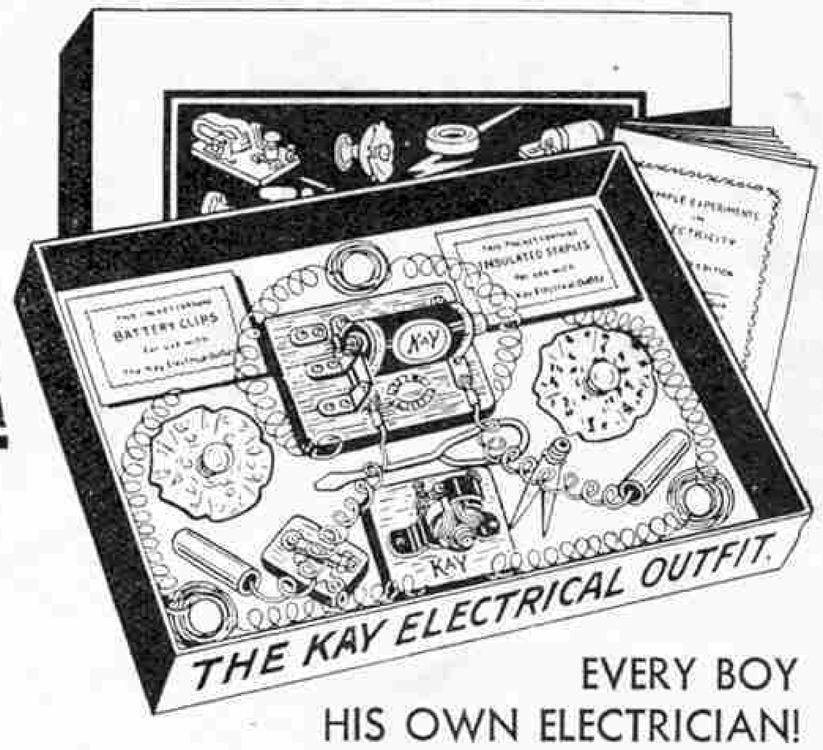
Each set is complete with 2 instruments, 30 ft. of twin wire, and full instructions.

25/– set.

And there are cheaper sets too at

10/6, 15/6 and **21/–** set complete.

ELECTRICAL OUTFITS



EVERY BOY HIS OWN ELECTRICIAN!

That is the motto for every proud owner of this wonderful Electrical Workshop which contains a powerful Electrical Induction Coil, a triple-coil Electric Motor, 2 Bulb Holders, 2 Fancy Shades, 2 Bulbs, a Turnscrew, Battery Tester, Switch, 3 coils of Wire, Battery Clips, Insulated Staples, and a splendid book full of instructions and experiments.

10/6 each.

And don't forget there are other outfits at **2/–, 3/6, 5/6, 7/6, 12/6, 15/–, 21/–, 30/–** and **50/–** each, the larger ones including Dynamotors, Tapper Sets, and Telephones in addition to Electric Bells, Induction Coils, Electric Motors and Lighting Equipment, etc.

Enter now for this Simple Competition!

10 First Prizes each a **21/–** Kay Chemistry or Electrical Outfit. 25 Second Prizes each a **10/6** Kay Chemistry or Electrical Outfit. 50 Third Prizes each a **5/–** Kay Chemistry or Electrical Outfit, and 100 smaller Kay Outfits as Consolation Prizes.

ALL YOU HAVE TO DO is to write IN NOT MORE THAN 25 WORDS, the reason "WHY I PREFER KAY CHEMISTRY AND ELECTRICAL OUTFITS."

Entries must be made on a POST CARD which must bear a 1d. STAMP, and competitors must also clearly state their FULL NAME AND ADDRESS and also the name and address of their local Kay dealer.

The completed card must be sent to KAY (SPORTS AND GAMES) LTD., COMPETITION DEPT., PEMBROKE WORKS, LONDON, N.10, to reach there not later than 12 o'clock noon on December 31st, 1934, and the results will be announced in the March 1935 issue of "Practical Mechanics."

Kay Outfits are obtainable from all leading Stores, Toyshops and Sports Shops. If you have any difficulty, please send direct to the manufacturers:

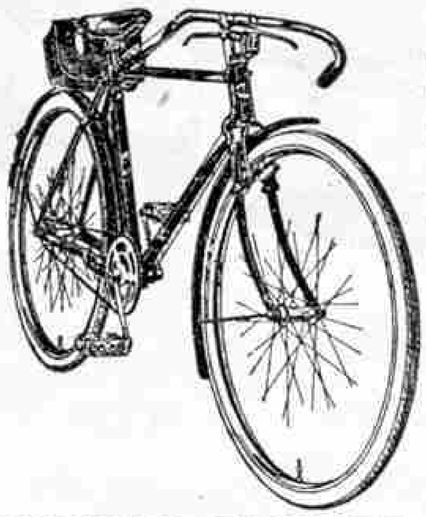
KAY (Sports and Games) LTD. Dept. M.M., PEMBROKE WORKS LONDON, N.10

SEND FOR A FREE ILLUSTRATED CATALOGUE

"... I know where the best Christmas presents come from"

AIR GUNS

We have a good selection of Air Guns in stock at all depots. As illustrated, breech loading with 100 shot. Price **4'11**

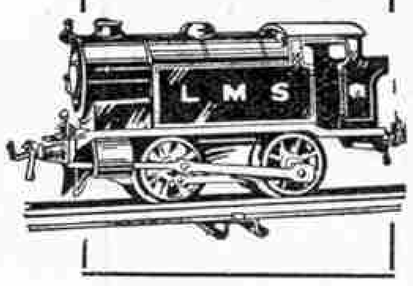


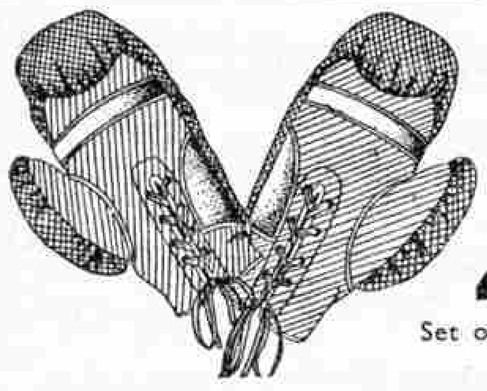
CYCLES

Halfords specialise in Cycles for Boys. Prices from **£3 19s. 6d.** Ask to see the "Club Juvenile" and the Boys' Pathfinder Models and put your name down for a copy of the new Halford Cycle Catalogue.

£3-19-6

More than 200 Halford Depots stock Meccano and Hornby Goods. Ask your local depot for a copy of the special Meccano Catalogue.





BOXING GLOVES

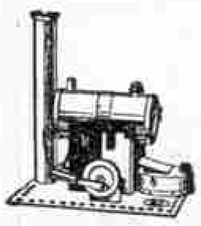
Strong fabric. Latest design Fingers with laced palms. Palm fitted with leather finger and side pads. Well padded. As illustrated. Price

4'6

Set of Four

SCALE MODEL AIRCRAFT

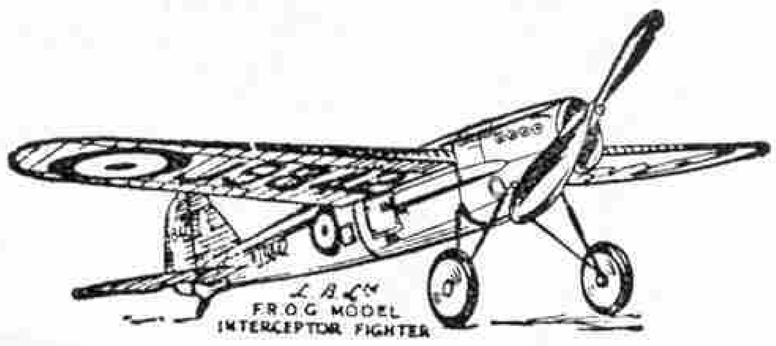
INCREASED RANGE AT EVERY HALFORD DEPOT.



Stationary Steam Engines from **7/6**

-tell Dad where the local Halford is

Halfords supply model Aircraft at prices from 1/6 to 17/6. All these models *really fly* and the "FROG" "Puss Moth" and "Terror" models are accurately built to scale. Come and see these splendid new models at your local Halford Depot



HALFORDS

-for Christmas presents you want

Halford Cycle Co. Ltd.
Head Office: Corporation Street
BIRMINGHAM

SEND FOR THE CHRISTMAS CATALOGUE

NAME.....

ADDRESS.....

.....

MENDED 31 years ago -still as good as ever!

We have a letter on our file, the writer of which tells us that in 1903, 31 years ago, he mended two completely smashed vases with Seccotine. The vases, he says, are still in use, although kept in all sorts of atmospheres during these years and for six months at one time actually stored in a damp cellar.

31 years ago! Think how that proves the enduring quality of Seccotine. Seccotine lasts! For fifty years it has been, deservedly, the most widely used adhesive. Ask for Seccotine when you need adhesive. It has no equal, but it has many imitations. Look for the name on tube and carton.

Obtainable from all good stationers, chemists, ironmongers, etc. 4½d., 6d. and 9d. a tube.

There is no substitute for

SECCOTINE

REGD

FIRST & STILL THE FINEST

1884-1934 50th ANNIVERSARY

POST THIS COUPON FOR FREE BOOKLET

To: Dept. M, M'Caw, Stevenson & Orr Ltd., Belfast

Please send me a copy of your Free Booklet.

Name.....

Address.....

MECCANO SUPER MODELS

INSTRUCTION LEAFLETS

The Meccano Super Models have been specially designed by our experts to demonstrate the immense possibilities of the Meccano System, and to show how machines and mechanisms of all kinds can be reproduced accurately and in working form by means of standard Meccano parts.

These 38 Models represent the highest pitch of Meccano construction, and each one is described in detail in a special Leaflet, fully illustrated from photographs. Every Meccano boy should make it his ambition to build some of these magnificent models.

A brief description of the nature of each model in the series is given below. Copies of the Leaflets can be obtained from any Meccano dealer, or post free direct from Meccano Ltd., at the prices shown at the foot of this page.

No. 1 MOTOR CHASSIS. This model runs perfectly under its own power. It has Ackermann Steering, Differential, Gear Box and Clutch, etc.

No. 2 SHIP COALER. All the movements of a real ship-coaler are reproduced in this model.

No. 3 MOTOR-CYCLE AND SIDE-CAR. The sidecar is of stream-line design and is mounted on springs. The motorcycle is complete with lamps, horn, exhaust pipes, etc.

No. 4 GIANT BLOCK-SETTING CRANE. This realistic model is fitted with an accurate reproduction of Fidler's block-setting gear.

No. 5 TRAVELLING BUCKET DREDGER. In this model trucks and wagons can run underneath the chute through which falls the material raised by the dredger buckets.

No. 6 STIFF-LEG DERRICK. This model has many interesting movements, including hoisting, luffing and swivelling, which are controlled by suitable levers.

No. 7 PLATFORM SCALES. This model will weigh articles up to 4½ lb. with remarkable accuracy.

No. 8 ROUNDABOUT. This model is most attractive when in motion. As the roundabout rotates the cars spin round and the horses rise and fall.

No. 9 BAGATELLE TABLE. This is an interesting model that will give hours of fun to the players.

No. 10 LOG SAW. In this model the saw is driven rapidly to and fro while the work table travels beneath it.

No. 11 SINGLE-CYLINDER HORIZONTAL STEAM ENGINE. Fitted with balanced crankshaft, crosshead, and centrifugal governor.

No. 12 STONE SAWING MACHINE. The model is equipped with adjustable work table and overhead trolley with self-sustaining chain hoist.

No. 13 MECCANOGRAPH. This wonderful model will draw hundreds of beautiful designs.

No. 14a GRANDFATHER CLOCK. A practical example of Meccano model-building. The model keeps accurate time.

No. 15 BALTIC TANK LOCOMOTIVE. The driving wheels are operated by an Electric Motor. An accurate reproduction of Walschaerts' Valve Gear is fitted.

No. 16a LOOM. This is perhaps the greatest Meccano success. The model weaves beautiful material.

No. 17 PLANING MACHINE. Fitted with quick-return motion.

No. 18 REVOLVING CRANE. This model is fitted with screw-operated luffing gear.

No. 19 STEAM SHOVEL. This model embodies travelling, rotating, racking and digging movements, and jib hoisting and lowering gear.

No. 19a STEAM EXCAVATOR, OR MECHANICAL DIGGER. A Meccano Steam Engine is incorporated in this model and provides the power for operating the four movements.

No. 20 MOBILE CRANE. This model has hoisting, luffing, travelling and slewing movements. It is fitted with an automatic brake.

No. 21 TRANSPORTER BRIDGE. The carriage automatically travels to and fro for as long as the motor is operated.

No. 22 TRACTION ENGINE. A remarkably realistic model that will pull a boy of average weight. Fitted with two speeds.

No. 23 VERTICAL LOG SAW. While the saws are in motion, the logs are fed slowly to them.

No. 24 TRAVELLING GANTRY CRANE. The movements of this model comprise the traversing of the entire gantry, hoisting and lowering, and the traversing of the crane trolley.

No. 25 HYDRAULIC CRANE The hydraulic ram is represented realistically by a powerful screw mechanism.

No. 26 TWIN ELLIPTIC HARMONOGRAPH. Some beautiful designs can be produced with this model.

No. 27 DRAGLINE. This imposing model of a giant excavator is fitted with travelling, luffing, slewing, and dragging movements.

No. 28 PONTOON CRANE. The movements of this model include the operation of the two hoisting blocks, slewing of the entire crane and luffing.

No. 29 HAMMERHEAD CRANE. This is a very realistic and powerful model, comprising traversing, hoisting and slewing motions.

No. 30 BREAKDOWN CRANE. This model is equipped with travelling, slewing, luffing, and hoisting motions.

No. 31 WAREHOUSE WITH ELEVATORS. The two cages are driven automatically and work alternately.

No. 32 TWIN CYLINDER STEAM ENGINE AND BOILER. This is a realistic working model of a complete steam plant.

No. 33 SINGLE AND DOUBLE FLYBOATS. These two models represent popular pleasure-fair attractions.

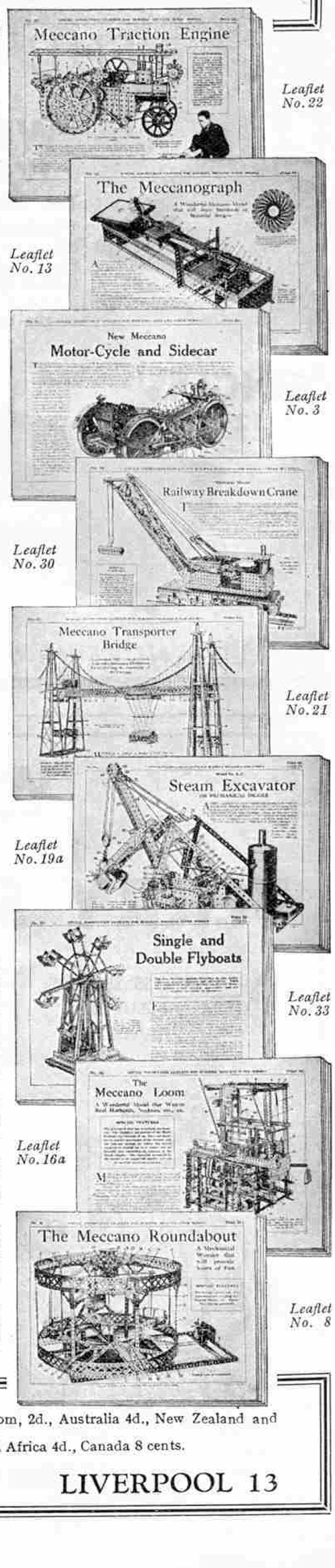
No. 34 THREE-ENGINE BIPLANE. This is a realistic model of an "Argosy" machine, and is fitted with ailerons, elevators and rudders.

No. 35 LEVEL LUFFING CRANE. The model is provided with level luffing gear, and an important feature is a grab that can be opened and closed automatically.

No. 36 ELECTRIC DERRICK CRANE (Scotch Type). This imposing model is built to a scale of ¾ in. to 1 ft. The movements include hoisting and lowering, luffing and slewing.

No. 37 HOWITZER, LIMBER & TRACTOR. The gun fires ammunition (Washers) with considerable force and accuracy. The tractor is fitted with "creeper" track.

Leaflet No. 34
Leaflet No. 4
Leaflet No. 1a
Leaflet No. 27
Leaflet No. 15
Leaflet No. 20
Leaflet No. 36
Leaflet No. 14a
Leaflet No. 32



Leaflet No. 22
Leaflet No. 13
Leaflet No. 3
Leaflet No. 30
Leaflet No. 21
Leaflet No. 19a
Leaflet No. 33
Leaflet No. 16a
Leaflet No. 8

Prices of Meccano Super Model Leaflets:—

Leaflets Nos. 3, 5, 6, 7, 8, 9, 10, 11, 12, 14a, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 36, 37—United Kingdom, 2d., Australia 4d., New Zealand and South Africa 3d., Canada 5 cents.

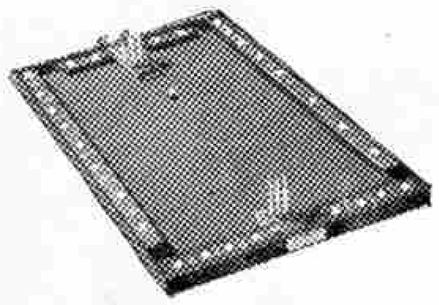
Leaflets Nos. 1, 2, 13, 15, 16a, 19a, 27, 30, 31, 32, 33, 34, 35—United Kingdom 3d., Australia 6d., New Zealand and South Africa 4d., Canada 8 cents.

Leaflet No. 4—United Kingdom 6d., Australia 1/-, New Zealand and South Africa, 8d., Canada 15 cents.

MECCANO LIMITED - BINNS ROAD - LIVERPOOL 13

THREE INDOOR OUTDOOR GAMES

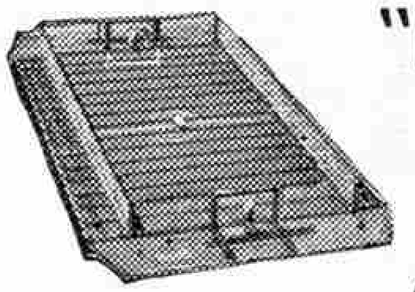
THE GAMES THAT ARE DIFFERENT



"WICKETS"
11'6 & 17'6

The Most Skilful Game in the World

"Wickets" is recommended by such great cricketers as HAROLD LARWOOD and PATSY HENDREN, who say it is the finest cricket game there is. The actual strokes are played and the batsman can be bowled or caught just as in the real game. A real test of skill.

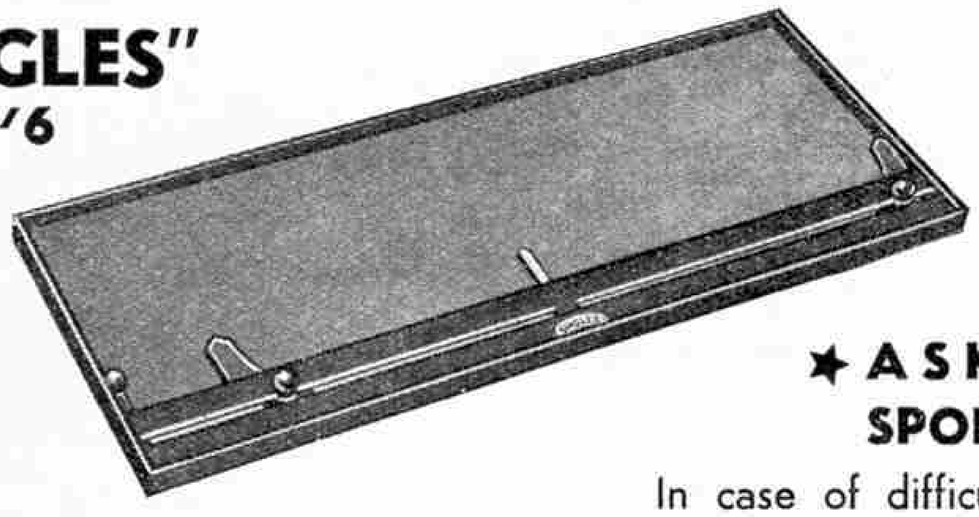


"FLICKICK"
17'6

The Fastest Game in the World

Actual football played on a board. The ball moves with great rapidity and excitement is intense as the goals are bombarded with fast and accurate shots. All the rules of football are in this game and those who are fond of the outdoor game will delight in "FLICKICK."

"SINGLES"
12'6



"SINGLES." A really unique game played like tennis but from a different angle. Plenty of fun and really skilful. A real breakaway from the usual.

★ASK FOR THESE GAMES FROM ALL SPORTS SHOPS, TOY SHOPS AND BIG STORES

In case of difficulty send to—

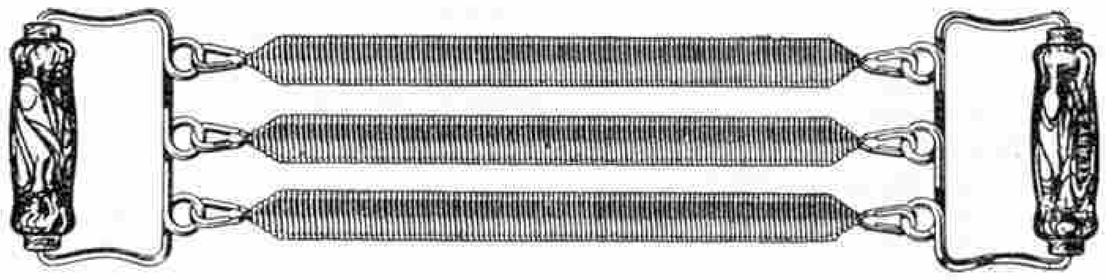
INSALL, ANDREWS & CO., 193, RICHMOND ROAD, TWICKENHAM, MIDDLESEX

WHEN TRAINING TELLS

TRAIN ON A

TERRY STEELSTRAND EXERCISER

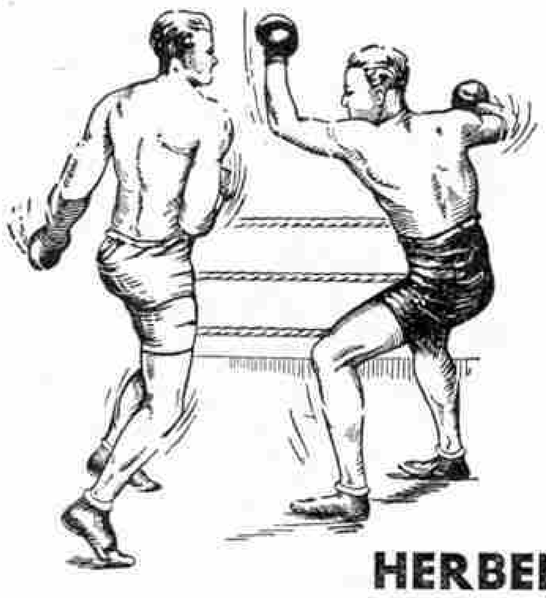
TIRELESS SPRINGS
CELLULOSE
HANDLES



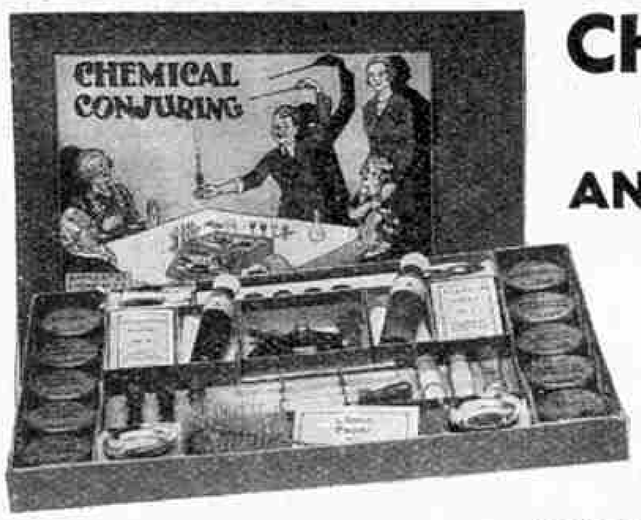
EACH EXERCISER
COMPLETE WITH
CHART

1 strand, 15 lbs. pull 5/6	1 strand, 20 lbs. pull 5/9	1 strand, 30 lbs. pull 6/–
2 ,, 30 lbs. ,, ... 7/6	2 ,, 40 lbs. ,, ... 9/–	2 ,, 60 lbs. ,, ... 9/6
3 ,, 45 lbs. ,, ... 10/–	3 ,, 60 lbs. ,, ... 12/3	3 ,, 90 lbs. ,, ... 13/–

LISTS FREE



HERBERT TERRY & SONS LTD., REDDITCH, ENGLAND



CHEMISTRY!
FULL OF FUN AND FASCINATION

The thrill of REAL CHEMISTRY at home combined with Magical Effects to amuse and surprise your friends. A booklet, The Chemical Conjurer, is supplied with each Outfit to show you exactly what to do.

BOTANY OUTFITS

SEE THE MARVELS OF NATURE in the continued growth of flowers and plants by many interesting tests and experiments.

Nature's Diary for December

Examine the following:

1. *Switches of Broom.*
2. *Flowers of Gorse.*
3. *Stems of Rushes.*
4. *Leaf stalks of Box.*
5. *Berry of Holly.*
6. *Leaves of Mistletoe.*

For both outfits apply to your local store or toy shop or write direct to:

DOLPHIN & CO. LTD., Hanley Street, BIRMINGHAM, 19.

FINEST VALUE in CHEMISTRY EQUIPMENT

HERE ARE TWO EXAMPLES OF THE VALUE WE OFFER

1 Flask, flat bottom, 150 c.c.; 1 Beaker, spouted, 100 c.c.; 3 Test Tubes, 4 in. × ⅝ in.; 1 Thistle Funnel, 20 cm.; 3 ft. Glass Tubing; 1 Rubber Cork, 2 holes; 4 ins. Rubber Connection Tubing; 1 Glass Stirring Rod. **2/6** Post Free.

1 Bunsen Burner; 2 ft. Rubber Tubing for Bunsen; 1 Tripod Stand; 1 Wire Gauze with Asbestos Centre; 1 Evaporating Basin, 85 c.c.; 1 Crucible and Lid; 1 Pipeclay Triangle; 1 Filter Funnel, 2 in. diam.; 100 Filter Papers, 11 cm.; 1 Thistle Funnel, 20 cm.; 1 Flask, Flat Bottom, 150 c.c.; 1 Beaker, Spouted, 100 c.c.; 3 Test Tubes, 4 ins. × ⅝ in.; 3 Test Tubes, 5 ins. × ⅝ in.; 1 Test Tube Holder; 1 Test Tube Brush; 6 ft. Glass Tubing; 1 Bone Spatula; 1 Rubber Cork, 2 holes; 1 Glass Stirring Rod. **10/6** Post Free.

IF THESE SELECTIONS OF APPARATUS ARE NOT WHAT YOU REQUIRE, WRITE FOR OUR CATALOGUE CONTAINING FULL DETAILS OF OTHER SETS FROM 2/6 TO 105/-. ALSO DETAILS OF:

INEXPENSIVE APPARATUS, CHEMICALS, MINERALS & TEXT BOOKS

A large range of Chemicals in bottles is available from 3d. each. An extensive selection of Laboratory Glass Ware, Stands, Basins, etc., and a new section on Minerals, the whole being supported by a complete section giving full details of up-to-date Text Books.

Write now to: **BECK** (Scientific Dept. G.)
60, High Street, STOKE NEWINGTON, N.16

WRITE FOR FREE CATALOGUE

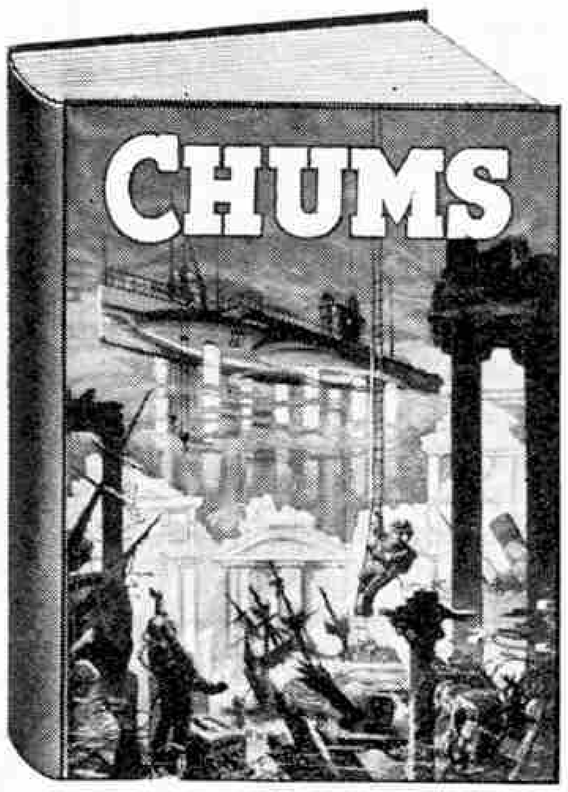
Four splendid Gift Books for every Boy!

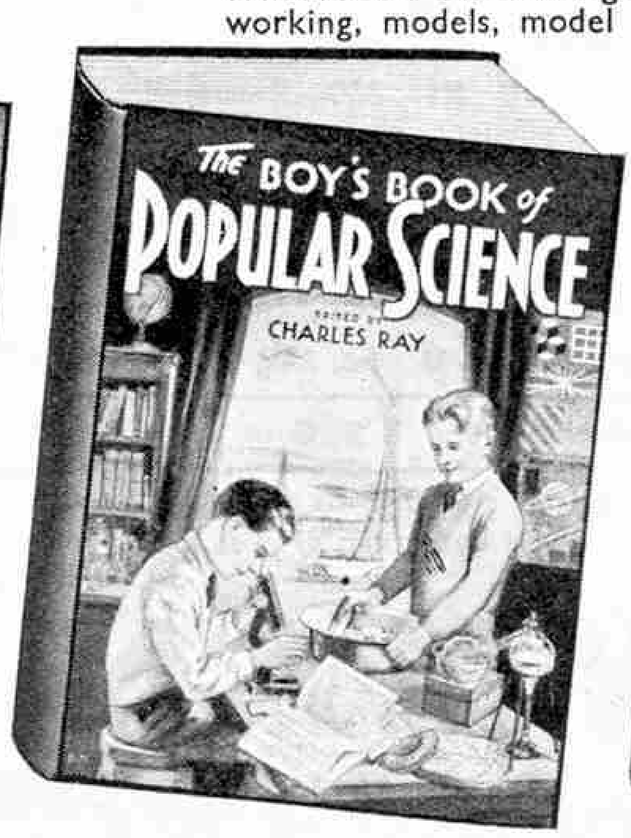
Here are four of the most interesting Annuals a boy can buy. Science, engineering marvels, model-making, woodworking, adventure, sport—all these fascinating subjects are to be found in these splendid books.

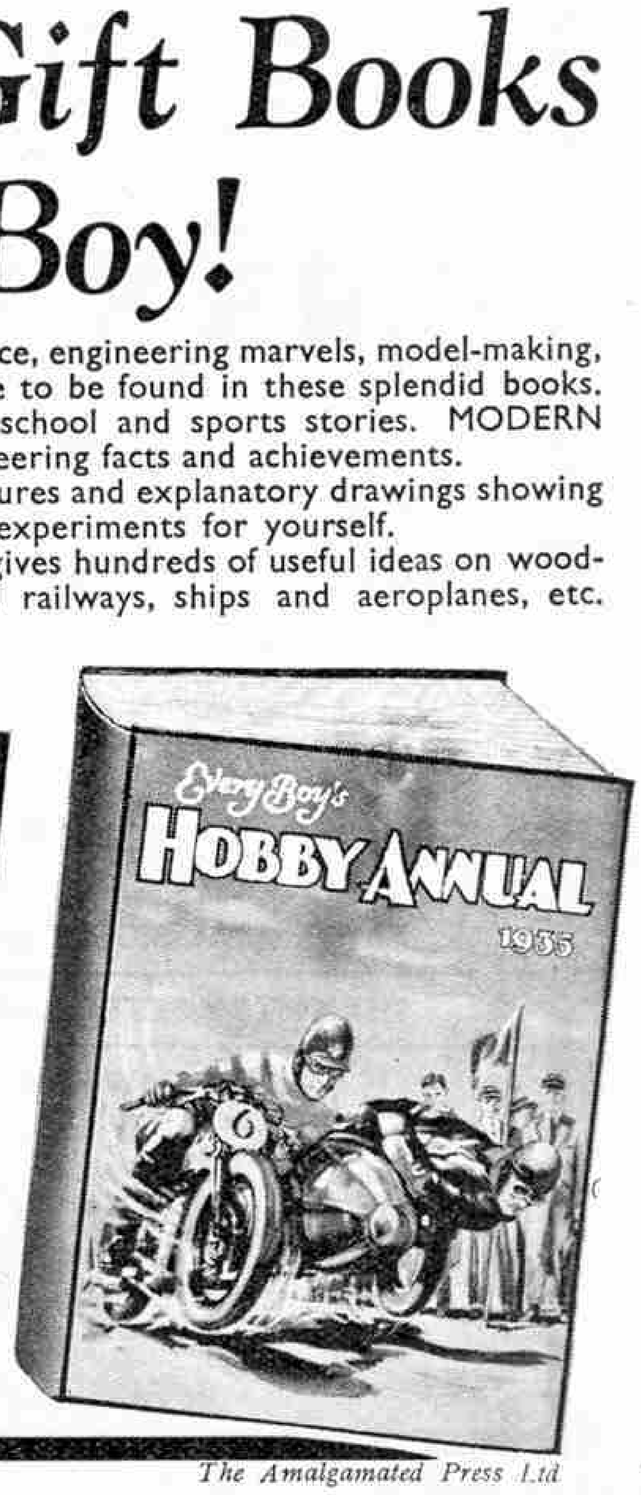
CHUMS ANNUAL contains nearly 800 pages of adventure, school and sports stories. MODERN BOY'S ANNUAL tells you about hundreds of scientific and engineering facts and achievements.

THE BOY'S BOOK OF POPULAR SCIENCE is full of grand pictures and explanatory drawings showing how things work, and it tells you how to carry out scores of experiments for yourself.

THE HOBBY ANNUAL gives hundreds of useful ideas on woodworking, models, model railways, ships and aeroplanes, etc.







CHUMS ANNUAL
12/6 net

MODERN BOY'S ANNUAL
6/- net

BOY'S BOOK OF POPULAR SCIENCE
6/- net

HOBBY ANNUAL
6/- net

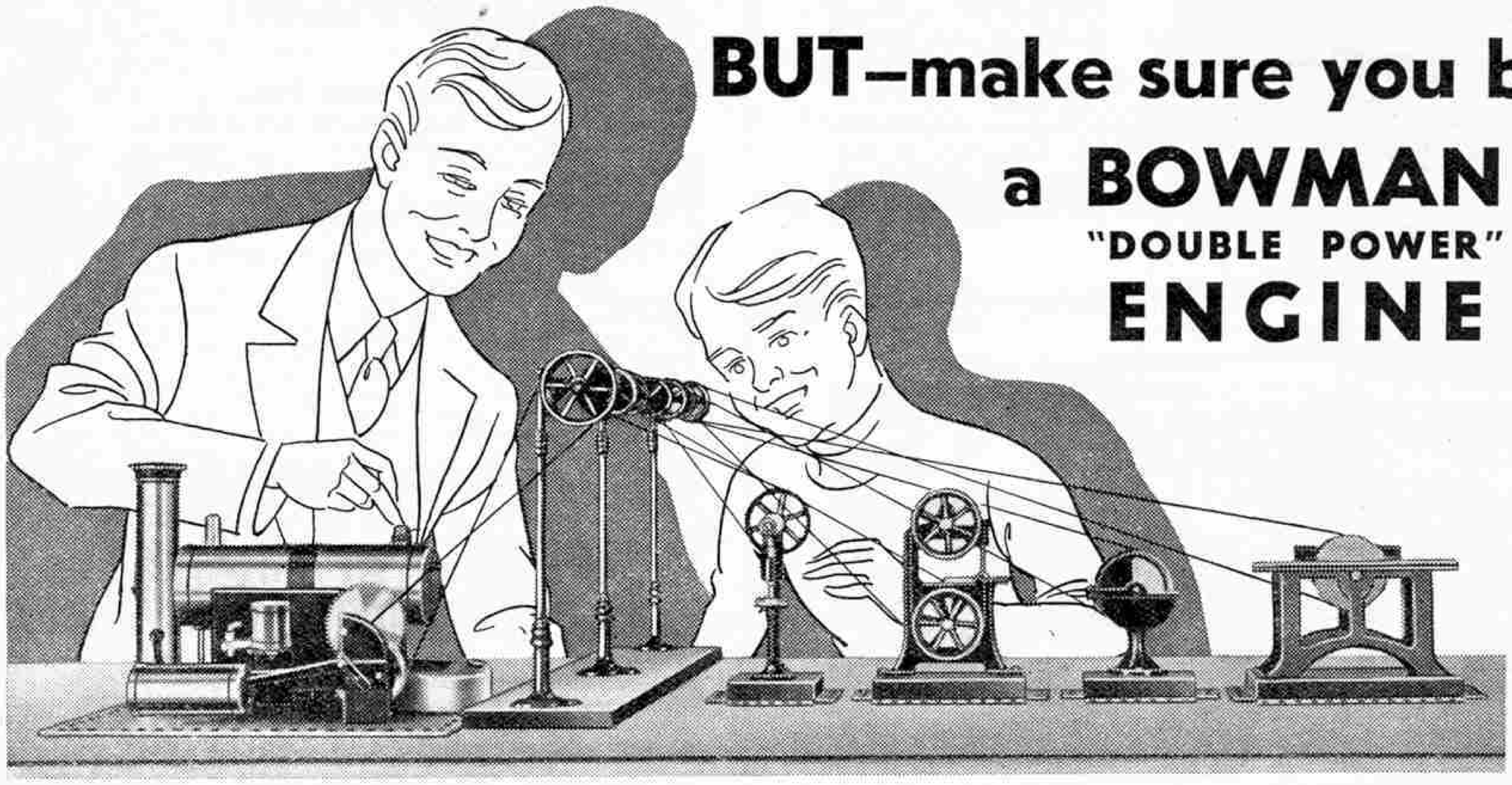
On Sale at all Newsagents and Booksellers

The Amalgamated Press Ltd

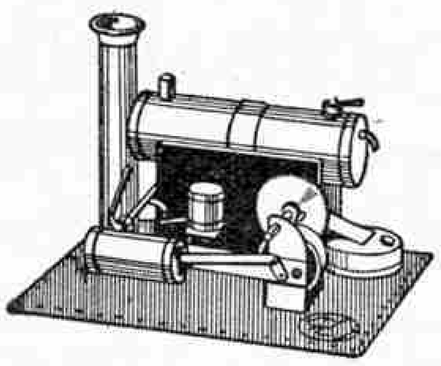
BE A REAL ENGINEER

AND DRIVE BY STEAM!

BUT—make sure you buy a BOWMAN "DOUBLE POWER" ENGINE



THE ABOVE PICTURE SHOWS STANDARD MODEL M135 DRIVING A MODEL WORKSHOP. JUST WHAT YOU WANT FOR THE LONG WINTER EVENINGS. START TO PURCHASE THEM NOW AND HAVE REAL FUN!

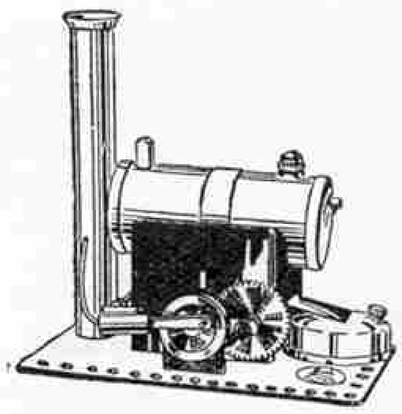


M135 illustrated. A wonderful engine, will lift 100 lbs. with suitable gearing. Solidly made of brass and steel, safety valve, drip feed lubricator. 2 speed gear, will take Meccano pulleys, sprockets, wheels, etc. Drilled metal base, Meccano pattern, by permission. PRICE **16/9** Post U.K. 1/–.

M175 illustrated. A good geared junior model. Works fairly large Meccano models. **9/–**

M180. A useful junior engine. Works small Meccano models, and will drive Dynamo No. 839. **7/6**

M158. 2 speed gear and pulleys. Runs for 25 mins. **12/6**



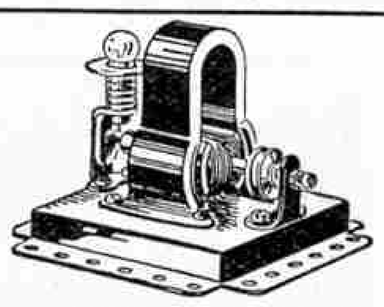
WORKING MODELS—well made reproductions.

Press No. 832	...	**3/3**	Circular Saw No. 833	...	**3/9**
Bandsaw No. 834	...	**3/11**	Grindstone No. 835	...	**2/9**

OTHER MODELS—

M122	...	**27/6**	**M101**	...	**37/6**
			M140	...	**14/6**

M130 Steam electric lighting plant, suitable for workshops, stations, etc. Gives a bright light for 40 mins. Price **21/–**

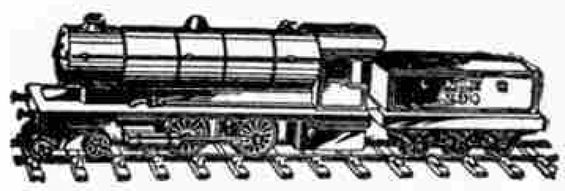


DYNAMO No. 839 illustrated, super efficient, gives bright light even with our smallest engine. Price **7/6**

MODEL 840, suitable for the larger type engine. Price **5/–**

ELECTRICAL MOTOR No. 844, 8/6 No. 845, 2/11

CHEMISTRY SETS, wonderful value ... **2/6** to **15/–**



OTHER MODELS—Loco 265, 25/– Loco 30, 21/– Loco 410, 10/6

LOCO 234, without Tender, **30/–**. Runs nearly 2 miles non-stop. Solid drawn brass boiler complete with safety valve. Exhaust through chimney. Steel frame. Length with Tender 20 ins. **TENDER 7/6**

ELECTRICAL SETS from **2/6** to **21/–**.
All models can be obtained from good Toyshops and Stores.

THE BOWMAN BOOK OF MODELS—an interesting treatise on model engineering and full details of all models—will be sent you by return of post if you send your name and address (and enclose threepence in postage stamps) to:

BOWMAN MODELS

(Dept. M.M. 28), DEREHAM, NORFOLK

SKYBIRDS

SKYBIRD LEAGUE

ANNOUNCE THE

D. H. "COMET"

Price 2/-

For the air-minded enthusiasts no hobby is so fascinating as the making of scale model Aeroplanes. SKYBIRDS provide the best means of assembling a collection of accurate 1/72 scale models. New models and accessories are always being added.

NEW NUMBERS:

The FAIREY "SEAL," No. 24, costs 4/6 and contains Fittings for Land or Seaplane version. Accessories: Pilot, Observer, and Machine Gun are obtainable for a few pence.

Ready shortly a famous model of the GREAT WAR

The "ALBATROS DIII."

For prices of assembled and painted models, see price list.

FOR THE GERMAN WAR-TIME MACHINES

a complete set of Mechanics, Pilots, etc., can now be obtained.
Price **1/3**

Skybird Christmas Greetings

An attractive Xmas card, designed by Mr. J. H. Stevens, for members of the SKYBIRD LEAGUE, in sets of six cards and envelopes.
Obtainable from Skybird Headquarters.
Post free **1/2**.

JOIN THE SKYBIRD LEAGUE!

Full particulars on application.

SKYBIRDS Publications:

NOW READY.—The SKYBIRD No. 4, a fascinating little magazine which appears quarterly and contains all the latest news about SKYBIRDS and also many interesting articles upon aeronautical matters. Post free Great Britain, **7**d.

Vol. 1, bound complete, **5/6**.

Binders for Vol. I, price **1/3**.

- THE CHRISTMAS NUMBER OF THE SKYBIRD will be ready in December, price 7d. post free.

SHIPSERIES

For those who have a nautical turn of mind, the SHIPSERIES 100 ft.=1 in. constructive waterline model Ships provide an equally attractive obby. Sets from 1/6 to 5/–. Our latest accessories include Cast metal Lightship, Lighthouse, and Tug. All to same scale, price 3d. each. Submarine, Flotilla of Six, price 1/–. Rocks 4½d., 6½d., 9d. and 1/3 assorted shapes.

SHIPSERIES LEAGUE

For list and address of nearest agent write:

A. J. HOLLADAY & CO. LTD. (Desk B)

3, Aldermanbury Avenue, LONDON, E.C.2

Be sure and get this book

THE KINGDOM OF THE CAMERA

Get this book for Christmas. It is one of the most fascinating books about photography ever published.

The author, whose knowledge of the subject is perhaps second to none, has written an account of what photography is doing to-day in the most important of its many spheres of activity. In particular in journalism, engineering, medicine, industry, aviation, crime detection, cinema, television, etc.

Profusely illustrated *7s. 6d. net*

by T. THORNE BAKER

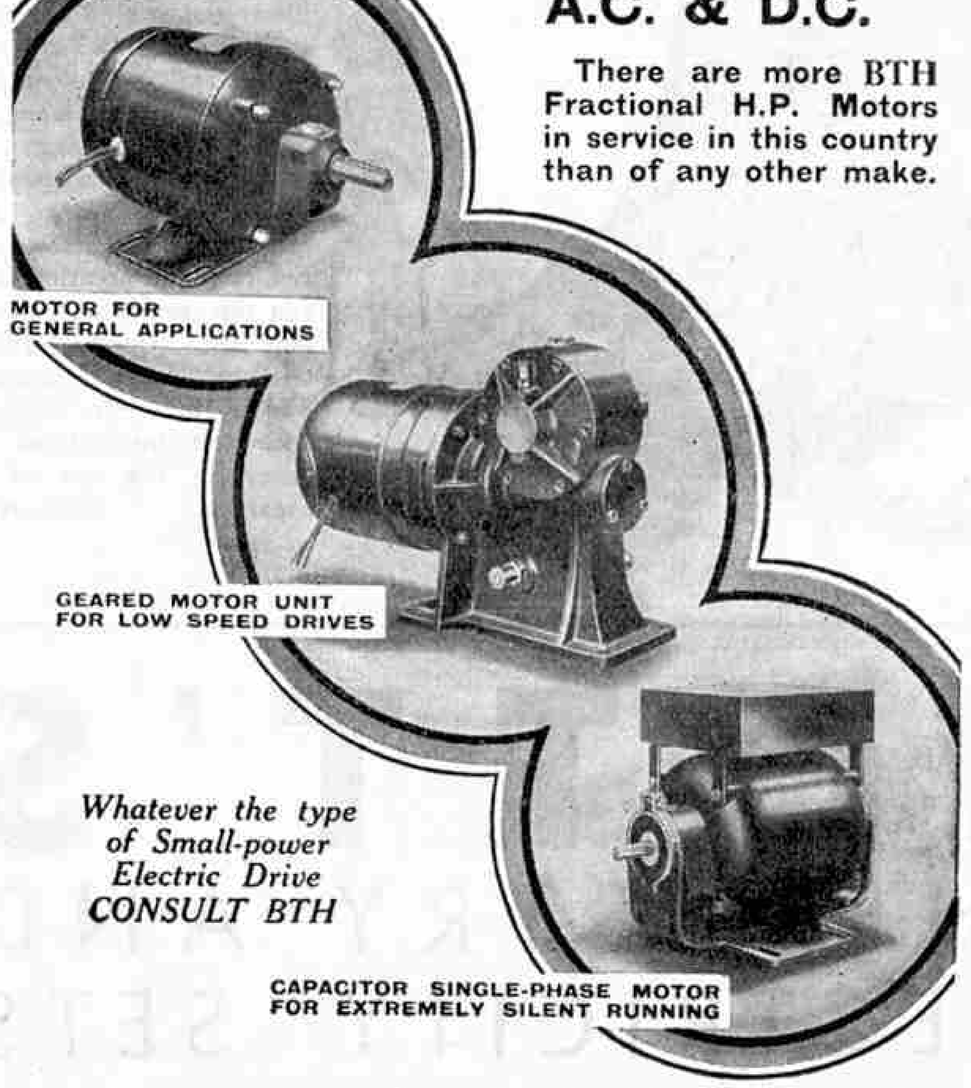
Obtainable from all BOOKSELLERS **Published by BELL**

B T-H

FRACTIONAL H.P. MOTORS

A.C. & D.C.

There are more BTH Fractional H.P. Motors in service in this country than of any other make.



Whatever the type of Small-power Electric Drive CONSULT BTH

BTH RUGBY

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED, RUGBY, ENGLAND

A1754

YOUR OWN LABORATORY

What about asking Dad for a Lott's Chemistry Set for Christmas? Then you can have your own "Lab," and start experimenting for yourself.

Colour changes in liquids, secret inks, crystal formations, evolution of gases, fire-proofing, oxidization, dyeing, bleaching and coloured fire are a few of the subjects of the fascinating experiments you can carry out.

Lott's Chemistry Sets contain chemicals and apparatus, including flasks, test-tubes, crucibles, Bunsen burner, etc. Full instructions and explanations (by a Doctor of Science) of the processes and reactions are given.

See your Dad about one NOW!

Complete Sets at **2/-, 3/6, 6/-, 10/6, 15/6,** and **21/-.**

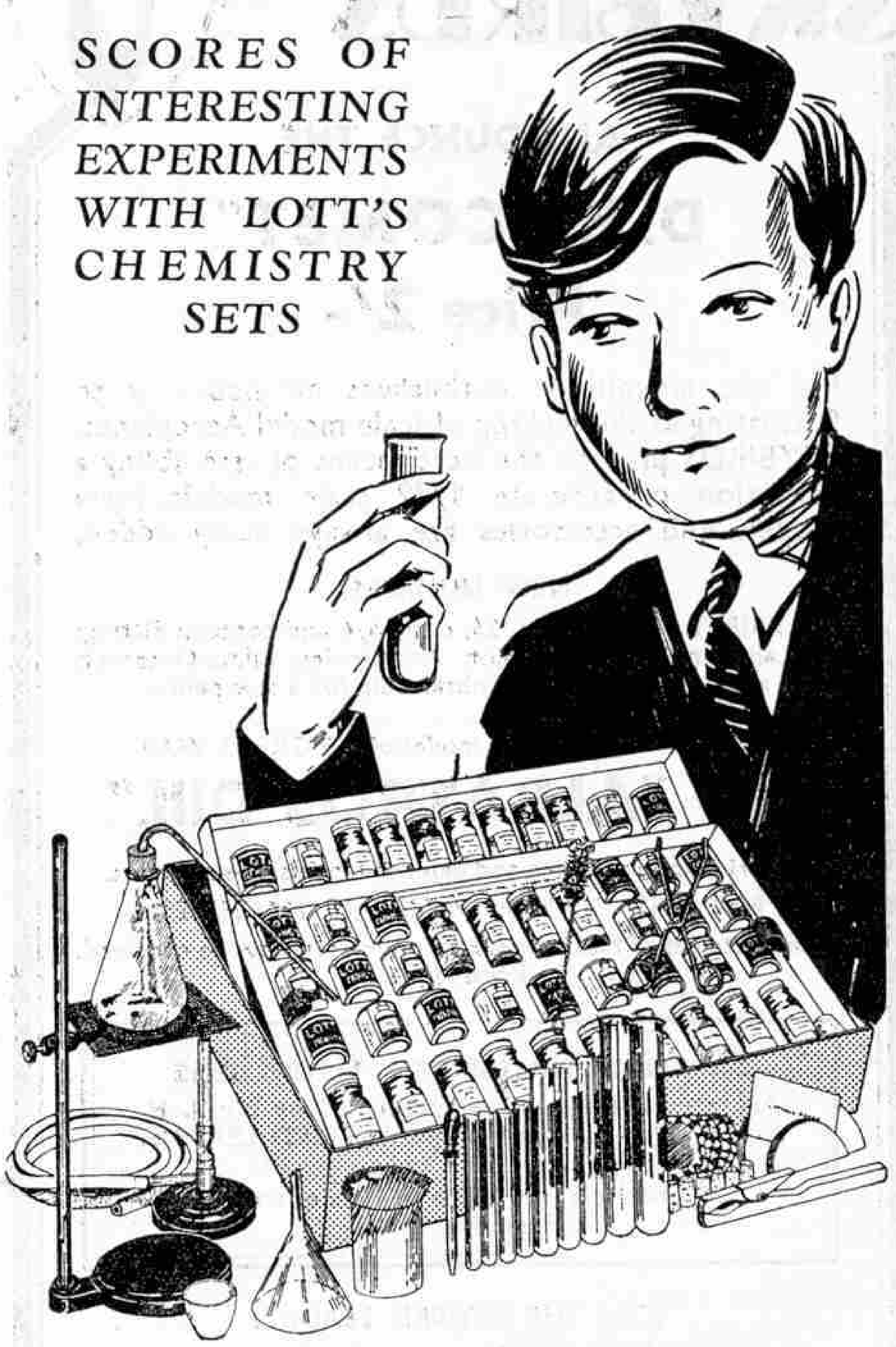
Larger Students' Cabinets at **31/6, 42/-, 73/6** and **105/-.**

Spare Supplies of all Chemicals and apparatus can be obtained.

BOX 3. As illustrated at side. Contains 30 chemicals, Bunsen burner with rubber connecting tube, large and small test-tubes, flask with rubber cork and delivery tube, porcelain crucible, glass funnel, filter papers, litmus paper, magnesium ribbon, glass tubing, test-tube cleaning brush and Book of 131 experiments. Price **10/6**

BOX 7. In this Cabinet illustrated at side the young experimenter is provided with a really useful range of laboratory equipment. It contains 54 bottles and cartons of chemicals and the apparatus includes glass retort, retort stand with two rings, deflagrating spoon and cap, pestle and mortar, sandbath, tripod, pipe-clay triangle, glass stoppered bottles, etc., etc. Complete with full instructions and notes on the use of the apparatus. Price **42/-**

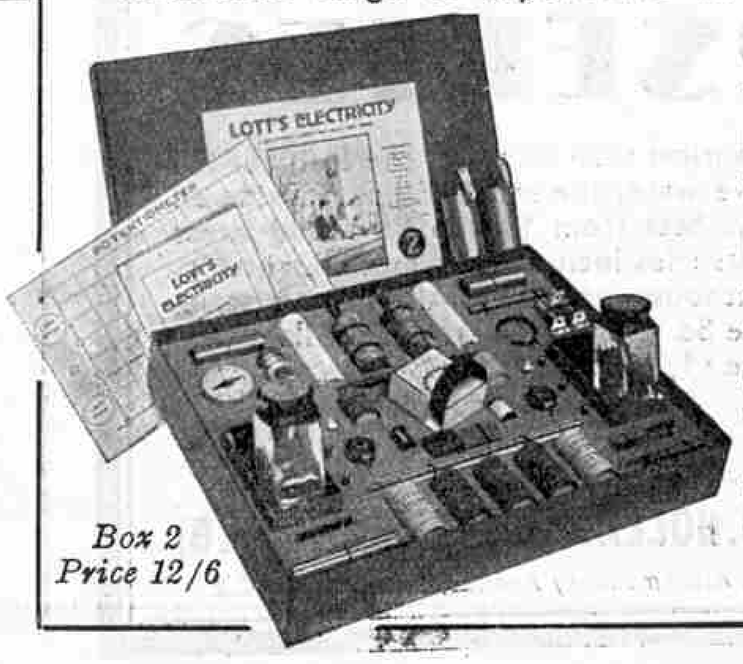
SCORES OF INTERESTING EXPERIMENTS WITH LOTT'S CHEMISTRY SETS



BOX 5. An especially fine set. Box 5 contains 43 chemicals and apparatus for a remarkable range of 228 experiments. The additional apparatus over and above the contents of the earlier boxes includes retort stand and ring (of great use in arranging the apparatus in a firm and convenient form), wire gauze, beaker and crucible tongs. Extra bottles of some of the chemicals most frequently used are also included. As illustrated above. Price **21/-**

LOTT'S ELECTRICITY

These sets provide the equipment for performing a really remarkable range of experiments in magnetism, static and current electricity.



Box 2
Price 12/6

Working models and instruments such as the following can be made:

Buzzer, relay, electrically operated railway signal, traffic signal, gold-leaf electroscope, electric motor, etc., etc.

Sets at **6/-, 12/6** and **21/-.**

LOTT'S
CHEMISTRY AND ELECTRICITY SETS

Obtainable at all leading Toy Dealers and Stores

Write for Free Illustrated Lists of all Lott's Products

Dept. M.M., LOTT'S BRICKS LTD., Watford, Herts.

BOYS! Here is A REAL

Super "Adana" High Speed Automatic Self-Inking

PRINTING MACHINE!

WILL PRINT ANYTHING FROM A

Visiting Card to a School Magazine

BOYS! Here is something you've often wished for—a Real Printing Machine! Not a toy or a model but an Automatic Self-Inking Adana Machine which uses real Printer's Metal Type and produces work just like that done by Professional Printers.

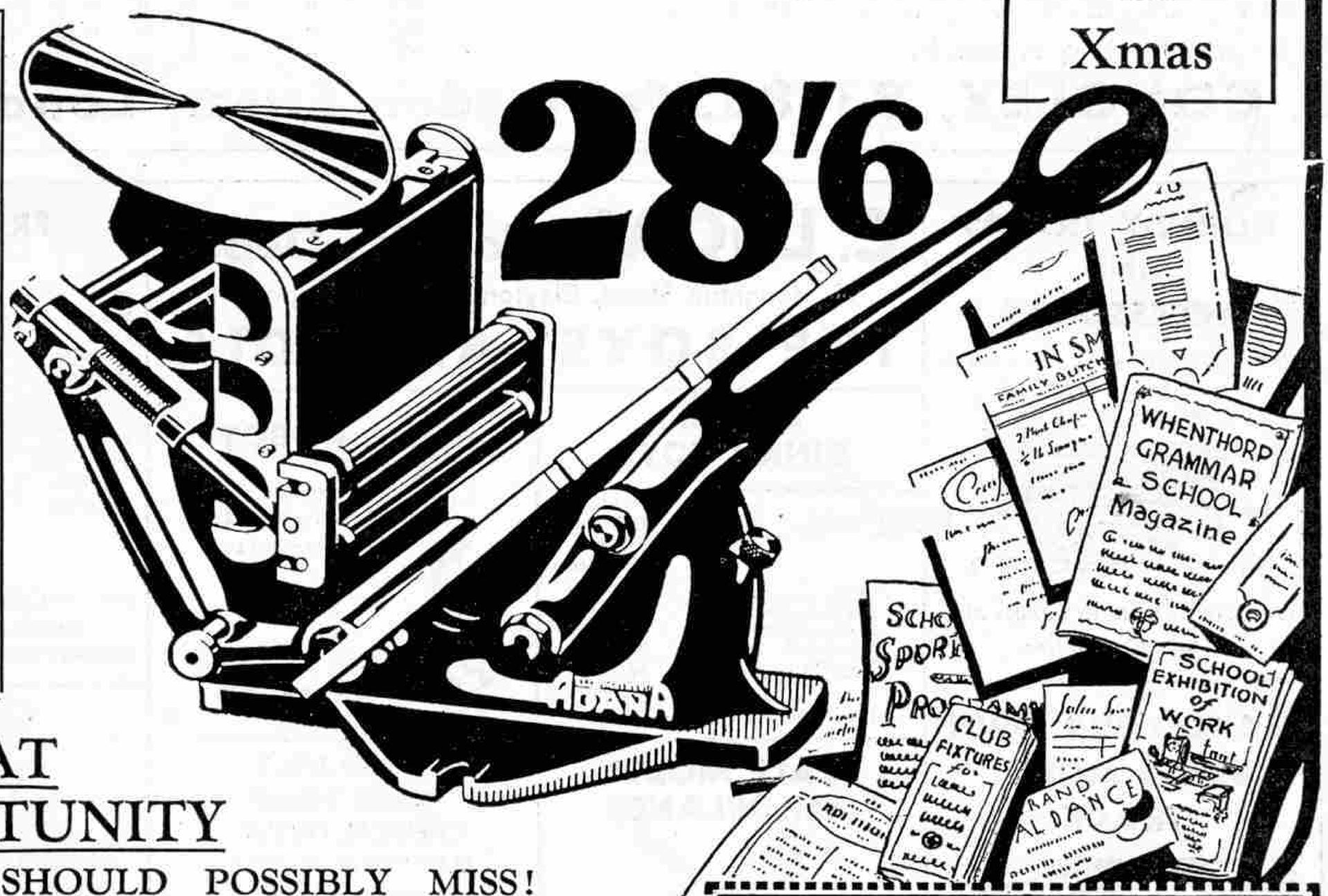
There's not a more exciting or interesting hobby than printing on my Wonderful Invention. You can print your own Noteheadings and Visiting Cards—Entertainment Programmes—Party Invitation Cards—School Magazines and a 101 other interesting things. It's so fascinating that you'll want to spend every spare moment at it!

WHAT A WONDERFUL XMAS GIFT!

Get Dad to get you one for Xmas

Here are some of the things my Machine will print

- School Magazines
- Fixture Cards
- Concert Programmes
- Dance Invitation Cards
- Noteheadings
- Visiting Cards
- Menus
- Tradesmans' Bills
- Club Notices
- Etc., Etc.



A GREAT OPPORTUNITY

NO BOY SHOULD POSSIBLY MISS!

No more "make-shift" rubber stamps or duplicators—here's the real thing and so low in price that you **MUST NOT** miss the chance of getting it! Let me tell you all about my Wonderful Machine and what it will do. Send the coupon alongside TO-DAY and I will send you FREE actual samples of work produced and explain how I will let you have it on Special Terms. No boy should miss this Splendid Bargain. It is a Real Commercial Machine, for many men make a lot of Money by printing on it for Local Tradesmen, etc. Find out all about it NOW. Send the Coupon alongside at once to

Mr. D. A. ADANA (Dept. M.C.13), 17, Church St., Twickenham, Middlesex.

LONDON Showrooms: Ludgate House, Fleet Street, E.C.4.
MANCHESTER Showrooms: 60, Oldham Street.

COUPON

To Mr. D. A. Adana (Dept. M.C.13), 17, Church St., Twickenham, Middlesex.

Dear Sir,

Please send me at once and FREE, full details of your Wonderful Adana Printing Machine—together with samples of ACTUAL Work produced, and Easy Payment Terms.

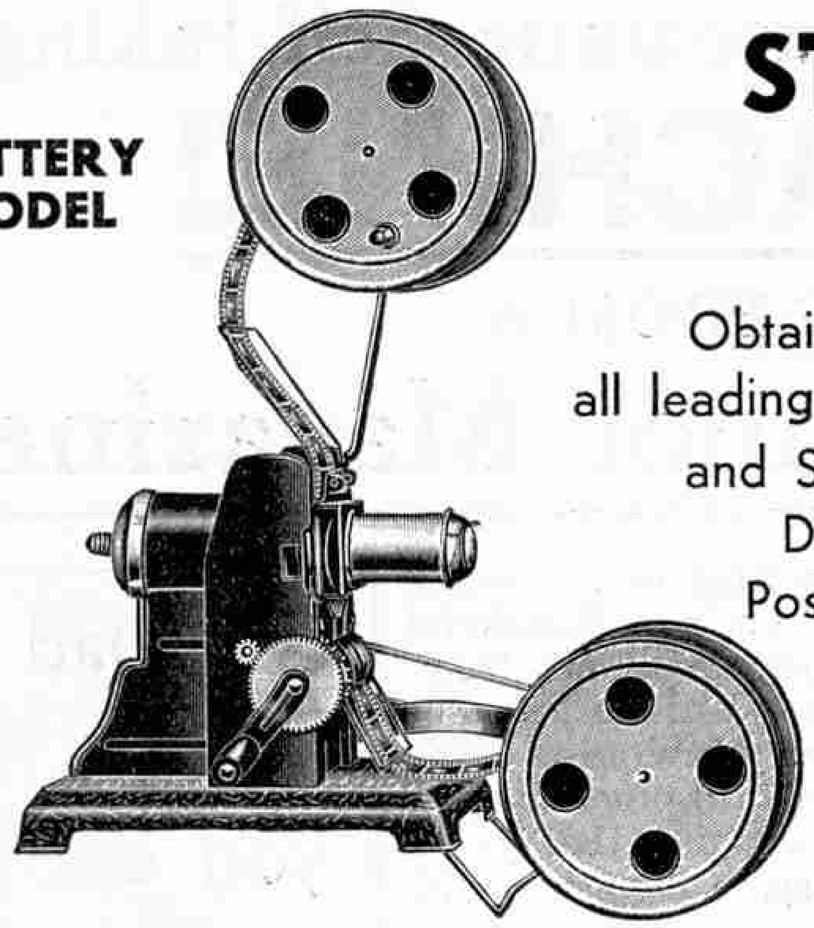
Cut out this Coupon and Post at once with your full name and address attached.

The INDCOL Playmate Cinemas

for

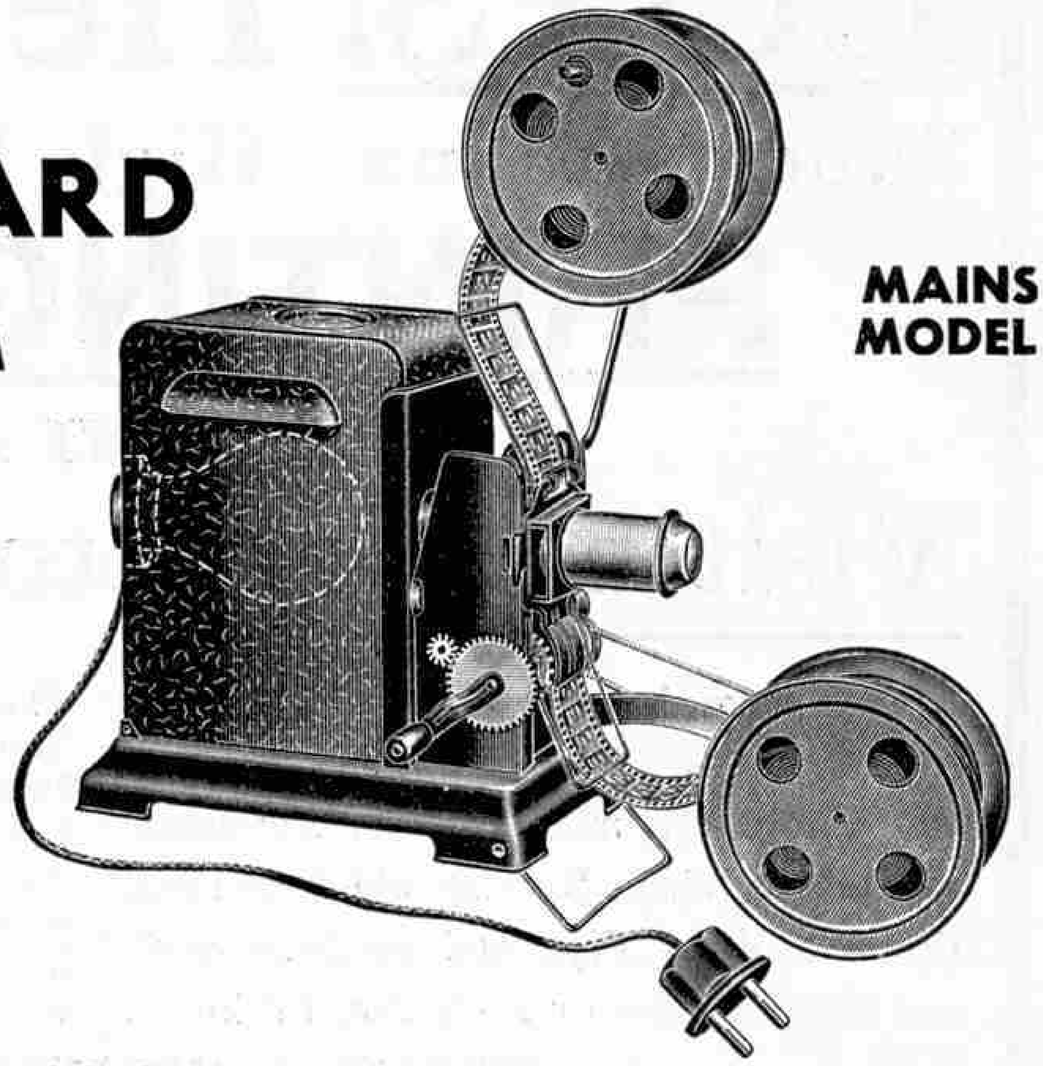
STANDARD FILM

BATTERY MODEL



Obtainable at all leading Toy Dealers and Stores or Direct Post Free

MAINS MODEL



402 Complete with 2 Films, Battery and Bulb **8/11** each
402/1 „ „ 3 „ „ „ „ **12/6** „

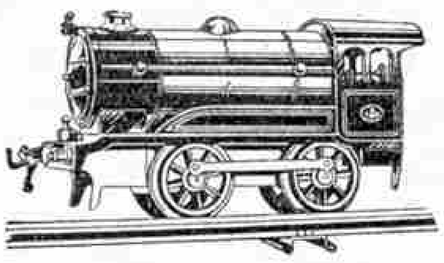
490 Complete with 2 Films and 2 Slides ... **12/6** each
492 „ „ 4 „ „ 4 „ ... **17/6** „
481 „ „ 2 „ „ 2 „ ... **18/6** „
482 „ „ 4 „ „ 4 „ ... **25/-** „

For full particulars, apply to Dept. M:

L. CONOLEY, 83/86, Farringdon Street, London, E.C.4

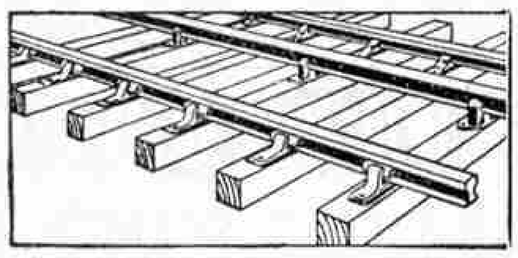
HORNBY TRAINS AND ACCESSORIES

We take pride in having everything in stock, either in sets or parts.



FREE LISTS OF HORNBY TRAINS AND MECCANO. Post Free.

MAKE YOUR OWN SCALE MODEL TRACK



RAILS. Non-rusting steel, 36" long ... ... 1/6 doz.
SLEEPERS. Black 1/8 100
CHAIRS. Cast 1/2 100

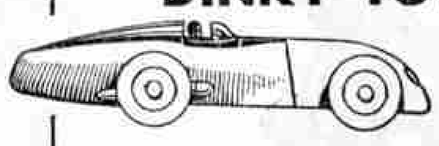
Write for free list of parts. Post. extra.

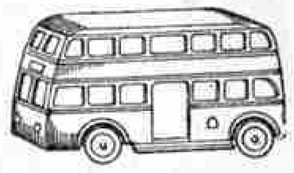
C. LUCAS, Hobbies Depot

17, Houghton Street, Clayton Square, Liverpool, 1

THE BOYS' ARCADIA

Meccano DINKY TOYS

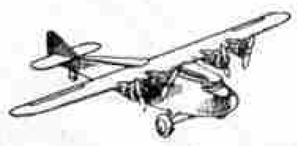




Motor Cars
Delivery Vans
Aeroplanes
Tramcars
Queen Mary
Warships
6d., 9d., 1/- each.

Of course we have all these in stock.

SCALE MODEL AEROPLANES



SKYBIRD 2/-, 2/6, 3/-
MODEL CRAFT ... ... 6d. each
(in parts to make up)
FINISHED MODELS ... 1/6, 2/-

ROBOTS

Two-light, 3/-
Three-light, 3/9
Four-way light, 4/11
Search-light
2" Lens 3/9
Giant 10/6

Price list free.

BILLIARD TABLES
TENNIS TABLES
CHEMICAL OUTFITS
ELECTRICAL OUTFITS
MODEL THEATRES
CONJURING
AEROPLANE MATERIALS
MOTOR BOATS

Carpenters' Tools, Sailing Boats, Steam—Electric—Clockwork Motors and many other lines

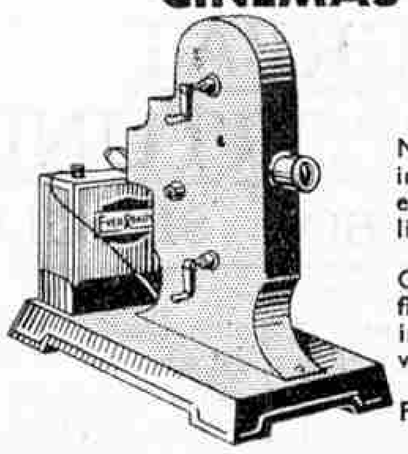
FRETWORK

We are Local agents for Hobbies Ltd.

Outfits 1/6, 2/6, 4/6, 7/6 to 20/-
Post 6d.

FRET MACHINES ... 25/-, 50/-, 75/-
Designs, Tools, Timber, etc.
Hobbies Catalogue, 268 pages. Price 6d.

CINEMAS



Newest invention electric light

Complete films in great variety

Free lists.

PRICES
WITH BATTERY 12/6, 17/6
DITTO. With clock motor ... 25/-
MAINS MODEL 22/6, 30/-
Write for free list.

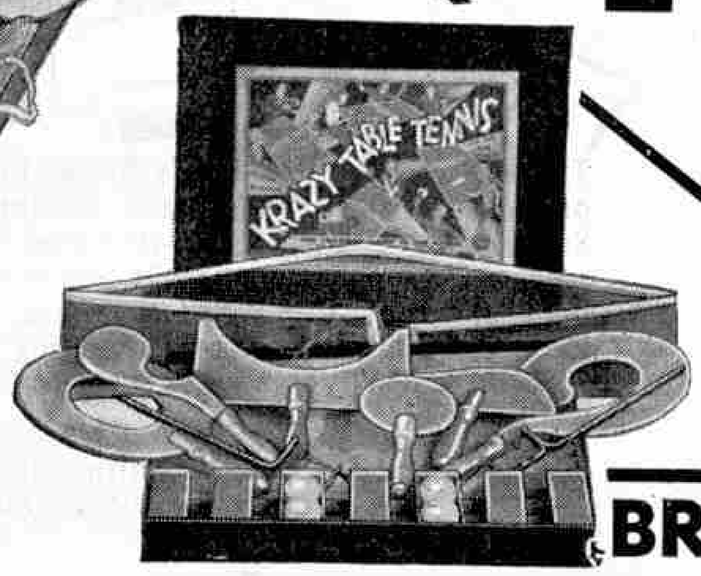
MAKE YOUR PARTY A RIOT OF FUN!

KRAZY TABLE TENNIS

WITH THE CRAZIEST AND FUNNIEST GAME IN THE WORLD

BCL TRADE MARK

No. 1 Set (above) with 4 Krazy Bats, Krazy Ball and Krazy Net with Clamps, **2/11**
No. 2 Set, with 6 Krazy Bats and 4 Balls **5/11**
No. 3 De Luxe Set, with 8 Krazy Bats and 6 Balls, Krazy Net with extended Clamps, **8/6**
One or more Krazy Balls are included in each set.



For Any Number of Players

Krazy Table Tennis is the latest, greatest and most amusing table game—a sheer riot of fun and laughter. For a really jolly time this Xmas you MUST play "Krazy"!

PRICES 2'11, 5'11 and 8'6

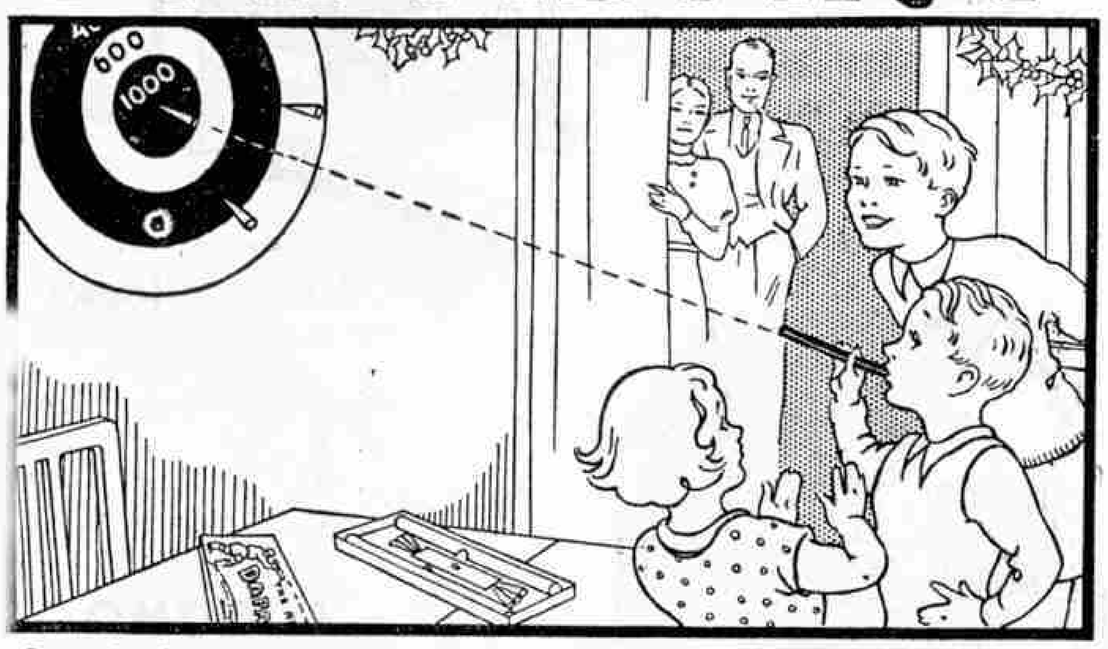
OBTAINABLE FROM ALL LEADING STORES, SPORTS DEALERS AND TOY SHOPS. IN CASE OF ANY DIFFICULTY, PLEASE WRITE DIRECT TO THE MANUFACTURERS AND PATENTEES.

Prov. Patent

BRITISH GAMES LTD. 20, ST. CLARE STREET MINORIES, LONDON, E.1

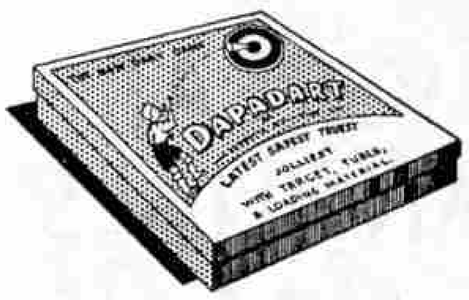
HERE'S A JOLLY GAME FOR XMAS

DAPADART



Reminder for every Father Xmas; don't forget to put a box of Dapadart in their stockings!

Zip! Another bull's eye. Well done Jack! Now, Joan, see if you can beat him. Place the dart in the tube and blow. Zip! Off it goes! Look how the Plasticine tip sticks to the target. It's great fun. The kiddies will love it. And grown ups won't be able to resist trying their skill at this new and fascinating game. In three sizes, complete with target, tubes and loading material.



6d., 1'-, 2'6

From all Stores, Stationers, etc. or post free 10d., 1/5 and 3/- from

HARBUTT'S PLASTICINE
99, BATHAMPTON, BATH

COMPLETE MODELLER
Very useful and interesting outfit. Just the thing for Xmas!
per **4'-** box
Post Free 4/9

PYRAMID
These new boxes will prove a delightful Xmas Gift.
per **1'-** box
Post Free 1/5

Give them a box of
HARBUTT'S
Plasticine
for Xmas

JOLLYBOX
An entirely new method of animal modelling. An ideal Xmas gift.
per **2'6** box
Post Free 3/

DESIGNER MINOR
A gift that is bound to please.
per **2'-** box
Post Free 2/6

THIS YEAR · BE SURE
You have a SIMPLEX TYPEWRITER

OVER 200,000 lucky boys and girls from 6-15 years of age are writing their letters, programmes, cards, etc., on their SIMPLEX TYPEWRITER.

A USEFUL GIFT

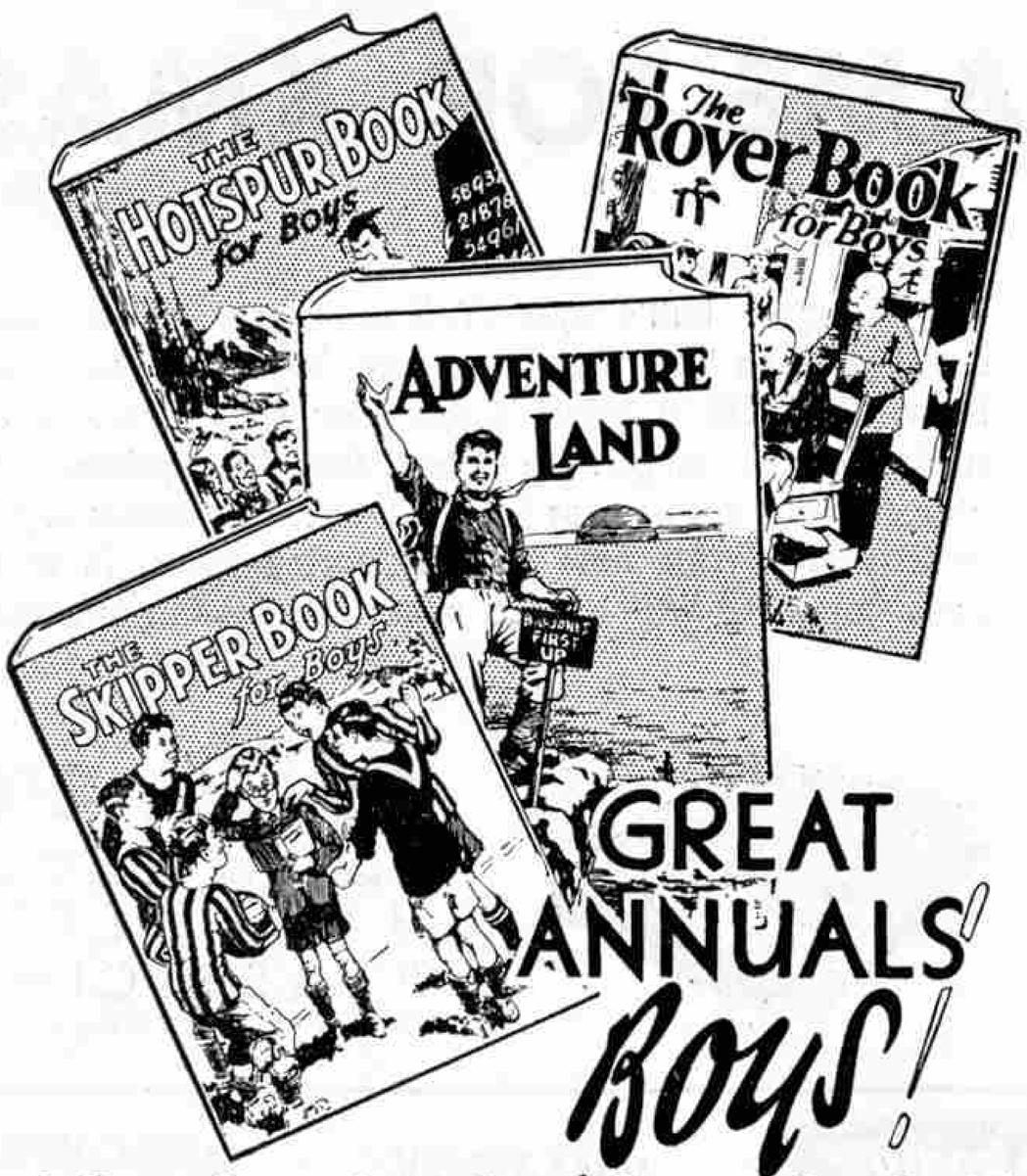
A TYPEWRITER AND PRINTING OUTFIT COMBINED.
COMPLETE WITH ALAPHABET, STOPS, NUMERALS ETC.

PRICES
5/–, 6/6, 11/6.
Capitals, numerals and stops.
15/–, 20/–, 25/–.
Capitals and small letters, numerals and stops.
Additional inks, 9d. each.

WRITES PERFECT LETTERS, CARDS, PROGRAMMES, ETC. COMPLETE WITH BOTTLE OF INK
GUARANTEED for TWO YEARS

Send for Illustrated List to:

SIMPLEX TYPEWRITER CO.
Walton House, 1, Newman St., London, W.1
From all High-Class Toy Dealers and Stores



GREAT ANNUALS for BOYS!

Adventure Land · 5/- Rover Book · 2/6
Hotspur Book · 2/6 Skipper Book · 2/6

MAKE YOUR CHOICE NOW. ON SALE EVERYWHERE

Stone Blocks for Miniature Buildings

BRITISH MADE

There is nothing like Lott's Bricks for building the models on your Model Railway system. Stations, Signal Boxes, Goods Sheds, Engine Sheds, Half-timbered Cottages for country scenes, Churches, Town Halls and all kinds of Houses can be built in stone. Just what you want, to make your display look real. Obtainable from all leading toy dealers and stores. Why not get a set this Christmas?

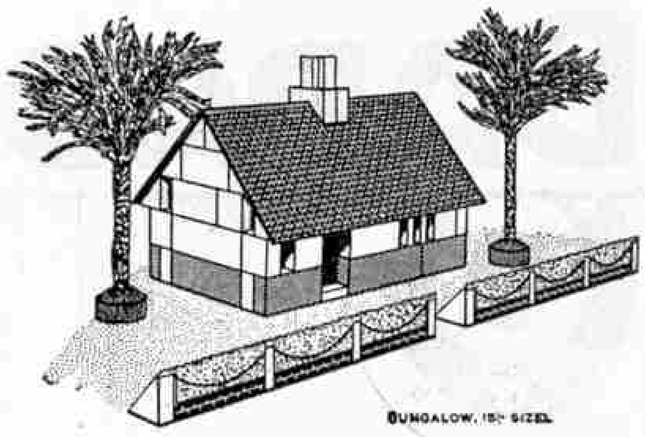
The designs supplied in the various sets of Lott's Bricks scale best with Gauge O models, although the bricks can also be used with other gauges.

LOTT'S BRICKS
for your Model Railway

Prices:

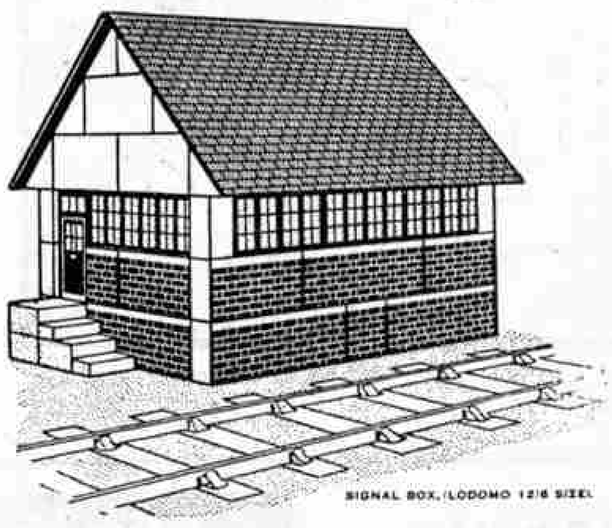
LOTT'S Bricks
Original Series

Box 0	...	...	2/–
„ 1	...	...	5/–
„ 2	...	...	10/–
„ 3	...	...	17/6
„ 4	...	...	25/–
„ 5	...	...	35/–


BUNGALOW, 1/8th SIZE.

Tudor Blocks
For building Old English half-timbered models

Box 1	...	...	3/6
„ 2	...	...	7/6
„ 3	...	...	21/–
„ 4	...	...	35/–


SIGNAL BOX, LODOMO 12/6 SIZE.

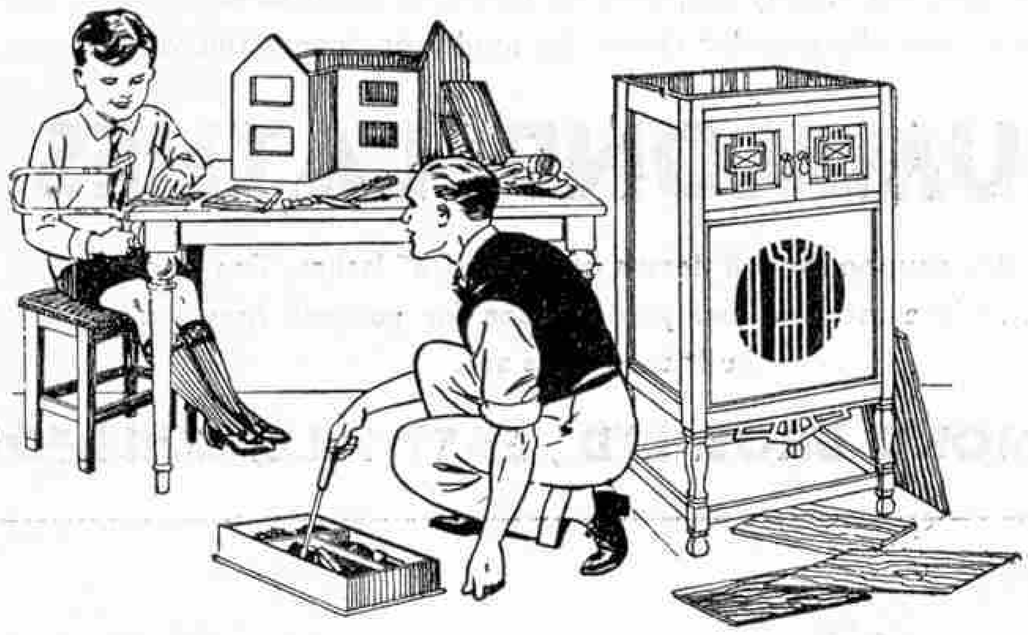
LODOMO
For building Models with doors, windows and correctly bonded brickwork

Box 1	...	...	3/6
„ 2	...	...	7/6
„ 3	...	...	12/6

Write for free complete Illustrated Lists to:

Dept. M.M., LOTT'S BRICKS LTD.
WATFORD, ENGLAND

Make them all with a HOBBIES FRETWORK SET



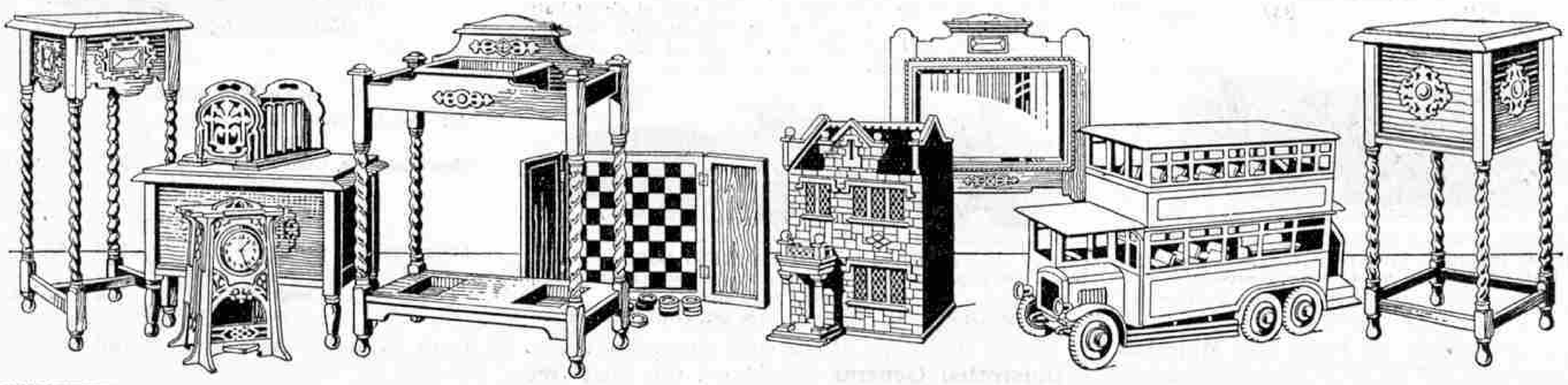
WHETHER you want to make a model of St. Paul's Cathedral, the Blue Bird or a Pit Head Gear; if you would make your own toys; if you want a hobby which brings you pocket money from your spare time, you must have a Hobbies Fretwork Outfit. See you have one for Christmas, and it provides happy hours with a set of tools you can use in useful and interesting work to prove yourself a craftsman and handyman. Outfits contain all necessary tools and instructions with wood and designs to start on. Insist on Hobbies to get the best.

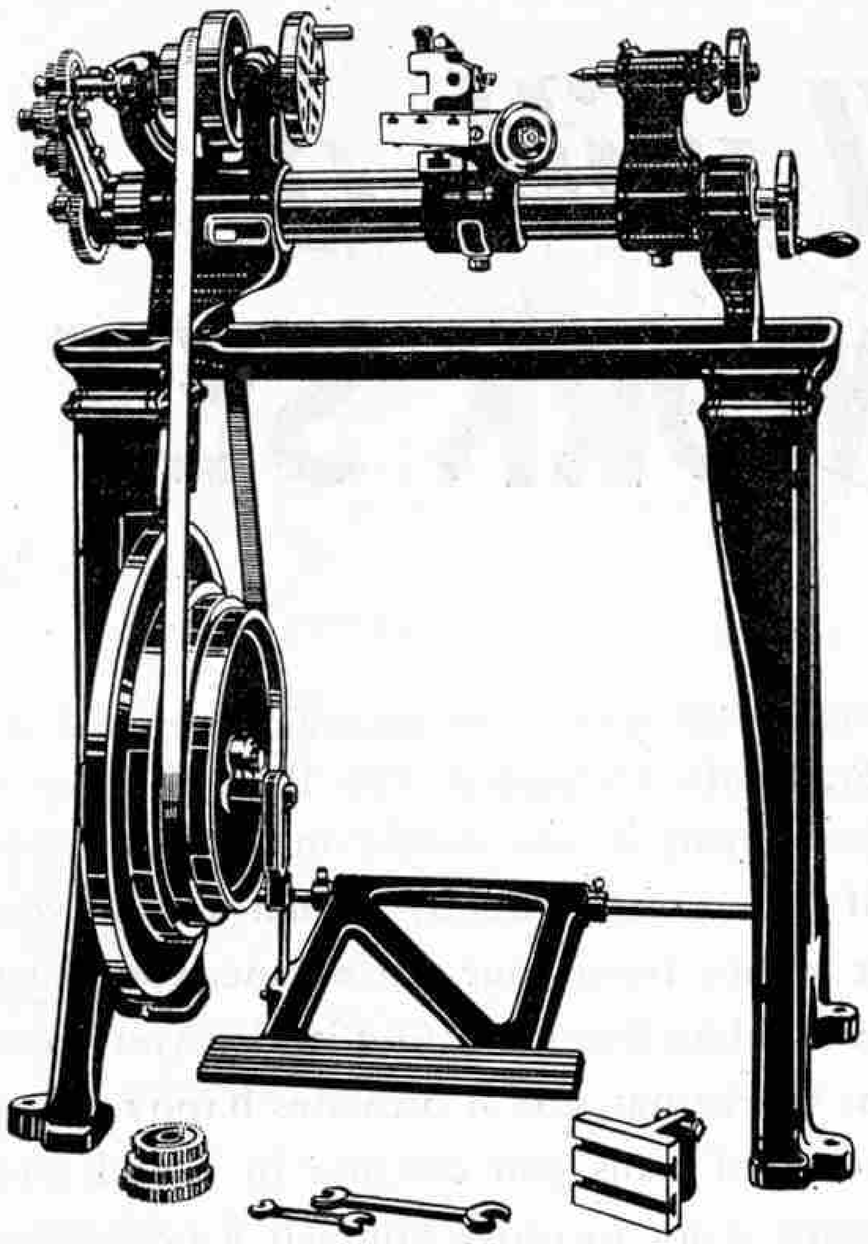
Look for Hobbies at all Christmas Toy Bazaars, leading Ironmongers, Stores, and Hobbies Branches. Or by post from Hobbies Ltd., Dereham, Norfolk.

COMPLETE TOOL SETS
FROM 1/6 to 42/-
BEST BRITISH VALUE
HAVE ONE FOR XMAS

FREE

Every reader will be interested in the new booklet telling you all about the hobby and what you can do with a set of tools. Write to-day to Dept. 96, Hobbies Ltd., Dereham, Norfolk, for a free copy. A post card will do.





DRUMMOND 4-in. LATHE WITH TREADLE AND STAND

A good lathe will last you a lifetime—make sure you get a genuine Drummond (British made).

The next step—take up real engineering

Now you are thoroughly keen on engineering, why not go in for model engineering and build real working model locos, marine engines, power boats, stationary steam, gas or petrol engines—you can become a practical mechanic. But you need a lathe, the great essential for the serious workshop. Then you can turn and machine all the parts just as they are machined in the prototypes, and build correct scale models. A Drummond Lathe is best for amateur use because it is specially designed for the work, is strong, accurate, handy to use, and readily adaptable to tackle all kinds of varied jobs. For over 30 years it has been the popular choice by model engineers the world over.

DRUMMOND LATHES

Send this coupon for full details of 3½" and 4" lathes. The booklets will interest you, and you will see for yourself how well-built the lathes are.

To DRUMMOND BROS. LTD., EAST HILL, GUILDFORD

POST THIS!

Please send me booklets on 3½" and 4" Lathes, post free.

(If without a letter, coupon goes unsealed for ½d.)

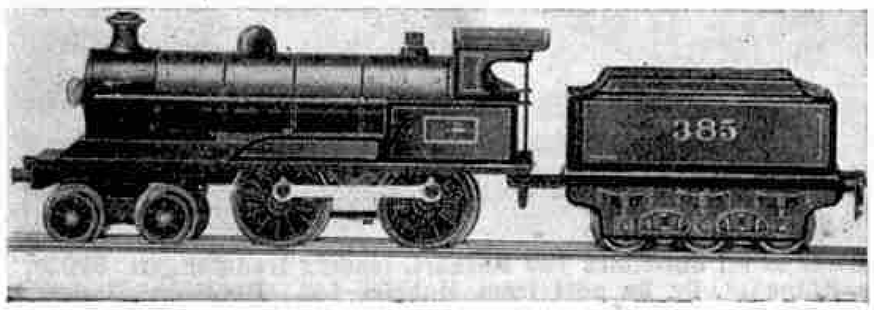
Name.....

Address.....

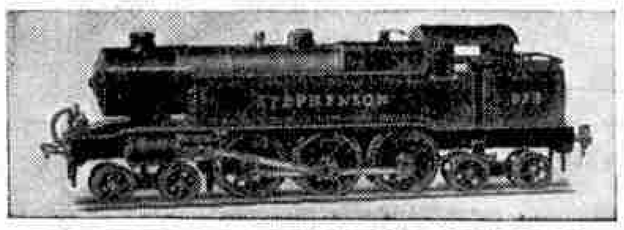
.....

BOND'S

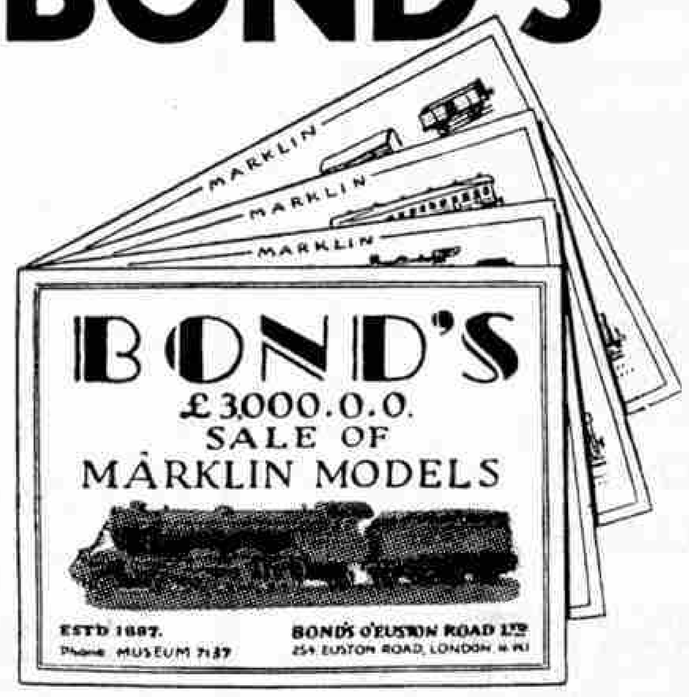
MARKLIN 0–4–0 TANK LOCO
Very Powerful Shunting Tank Loco for **accumulator working only.** Self-reversing.
Price, **Gauge "O"** ... ... **10/6** Postage 9d.
(List Price 16/6)



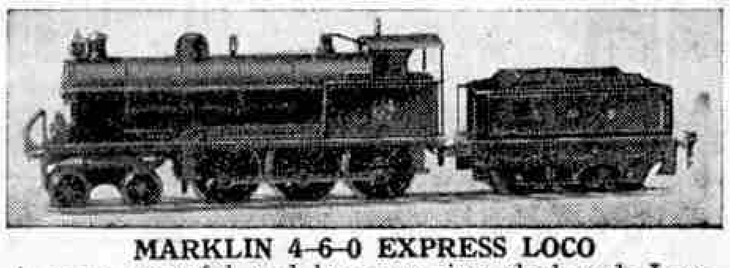
MARKLIN 4–4–0 EXPRESS LOCOS
Very Powerful Electric Mechanism for **accumulator working only.** Self-reversing.
Price, **Gauge "O"** ... ... **16/6** Postage 9d.
(List Price 28/6)
Price, **Gauge "1"** ... ... **34/–** Postage 1/–
(List Price 63/–)



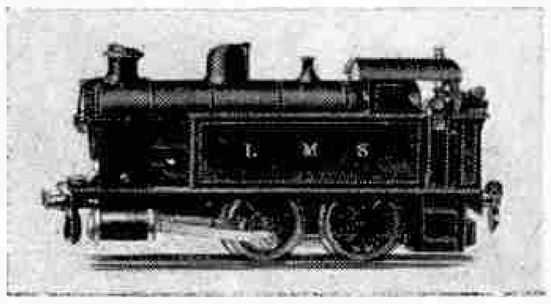
MARKLIN 4–6–4 EXPRESS TANK LOCO
The most Powerful Clockwork Tank Loco made. Fitted **Speed control,** brake and reverse.
Price **Gauge "O"** ... ... **30/–** Postage 1/–
(List Price 55/–)



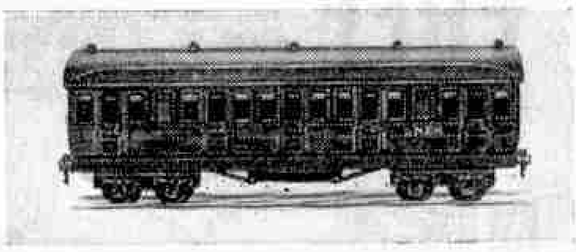
Great Sale of MARKLIN Clockwork, Steam and Electric Locomotives, Coaches, Trucks, etc., for Gauge "O" and Gauge "1."
Nearly all of these Models are being sold at about half the original cost. Send for our Special Free Marklin Catalogue, and be sure to get one of the bargains before stocks are sold out.



MARKLIN 4–6–0 EXPRESS LOCO
A very powerful and long running clockwork Loco, with **speed regulator.**
Price, **Gauge "0,"** 34/– Postage 9d. (List Price 63/–)



MARKLIN 0–4–0 TANK LOCOS
Powerful Steam Loco, reversing, piston valve cylinders.
Price, Gauge "O" ... ... **18/9** Postage 9d.
(List Price 37/6)
Price, **Gauge "1"** ... ... **33/–** Postage 1/–
(List Price 57/6)
Tender Locos similar to above.
Price, **Gauge "O"** ... ... **15/–** Postage 9d.
(List Price 30/–)
Price **Gauge "1"** ... ... **28/6** Postage 1/–
(List Price 51/–)

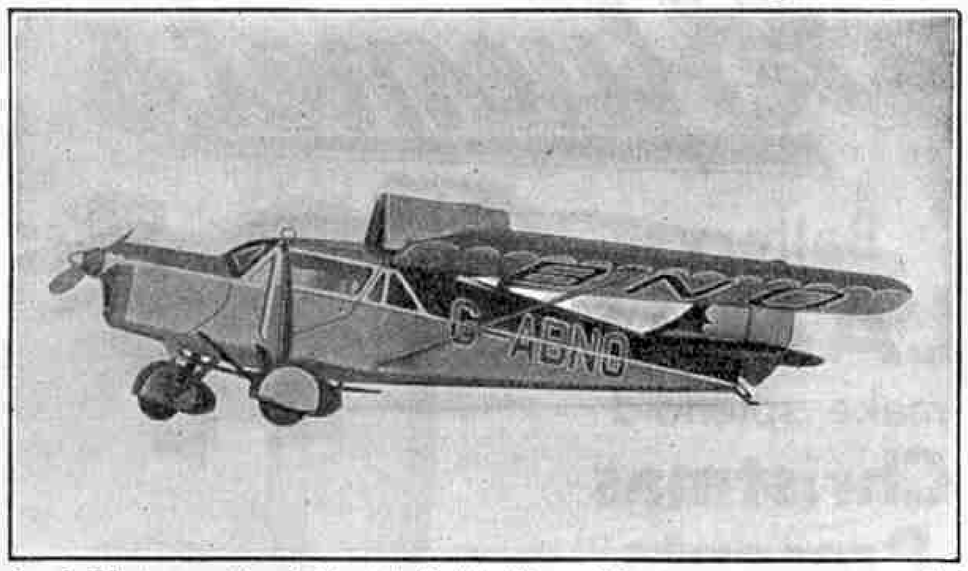


MARKLIN COACHES
All Metal Coaches and Luggage Vans, very strong mounted on bogies.
Short Coaches, Gauge "O" ... **3/–** Postage 6d.
(List Price 4/6)
Gauge "1" ... **5/–** Postage 9d.
(List Price 7/6)
Long Coaches, Gauge "O" ... **5/6** Postage 9d.
(List Price 9/6)
Gauge "1" ... **7/6** Postage 9d.
(List Price 14/6)

Bond's can supply all **Parts** and **Materials** for Model Railways, Boats and Aeroplanes, also all **Tools** to make them with. Send for Bond's Illustrated General Catalogue, **6d.** post free.

Established 1887. **BOND'S O' EUSTON ROAD LTD., 254, EUSTON ROAD, LONDON, N.W.1.** 'Phone: Museum 7137.

AEROMODELS



Actual Photograph of Model D.H. Puss Moth. Wing Span 18⅜ in.

SCALE MODEL CONSTRUCTION SETS 1/24th ACTUAL SIZE

Making scale model aircraft is an engrossing hobby. Aeromodel Kits have been specially designed to enable YOU to build Perfect Detailed Scale Models of Exhibition Standard without special tools or skill. Aeromodels are "Built Up" with double surfaced correctly cambered wings on spars and ribs, and cabin types have opening doors, transparent windows and interior seats.

AEROMODEL No. 8
"HAWKER HART"
Complete with guns, etc.
READY SOON!

Other Models	PRICE	Post Free Gt. Brit.	do. Abroad
1. GIPSY MOTH	... 3/–	3/4	4/–
2. COMPER "SWIFT"	... 3/6	3/10	4/6
3. PUSS MOTH	... 3/6	3/10	4/6
4. SCHNEIDER SEAPLANE ...	... 4/–	4/4	5/–
5. DE HAVILLAND "DRAGON"	... 7/6	8/–	8/9
6. DE HAVILLAND "FOXMOTH"	... 4/–	4/4	5/–
7. S.E.5a	... 3/6	3/10	4/6

Sold by HAMLEY'S, 200, Regent Street, London, W.1.

Fill in the coupon and post it to-day. A ½d. stamp is sufficient if the envelope is unsealed.

Please send me free illustrated literature containing full details of all Aeromodel Sets, also of "HAWKER HART" when ready.

Name .....

Address .....

..... M.

AEROMODELS LTD., Hooton Road, Willaston, Wirral, Cheshire.

Trade enquiries invited.

English Patent No. 348973

Dynamo Electric Cycle Lamp

SUPERSEDES BATTERY LAMPS

Mr. E. R. Upwell, nr. Wisbech, writes: "It is a wonderful invention and **big value for money."**

Produces its own light by movement of the cycle—

No batteries to run down, or other expensive replacements.

No. VM/76 with large silver-plated reflector (dia. 2¾"), **7/6 post free.**

FITTED TO CYCLE IN A FEW MOMENTS

A Light Always Ready

Pamphlet "M.M." giving full particulars of this wonderful Dynamo Electric Cycle Lamp—sent FREE on application.

From your Cycle Stores, or C.O.D. post free, from manufacturers:

INVENTIONS (Manchester) LTD.
PENDLETON MANCHESTER.6.

The December BOY'S OWN PAPER

will be a

DOUBLE CHRISTMAS NUMBER

Contents include:

An Exciting Serial

NUMEROUS LONG COMPLETE STORIES

of school, and adventures on land and sea

32 PAGE PHOTOGRAVURE SUPPLEMENT

A Great Number of Absorbing Articles

COMPETITIONS
MANY FINE PRIZES

Hobbies - Sport - Jokes - Verse

PRICE: 1s. 6d.

See that you get your copy early

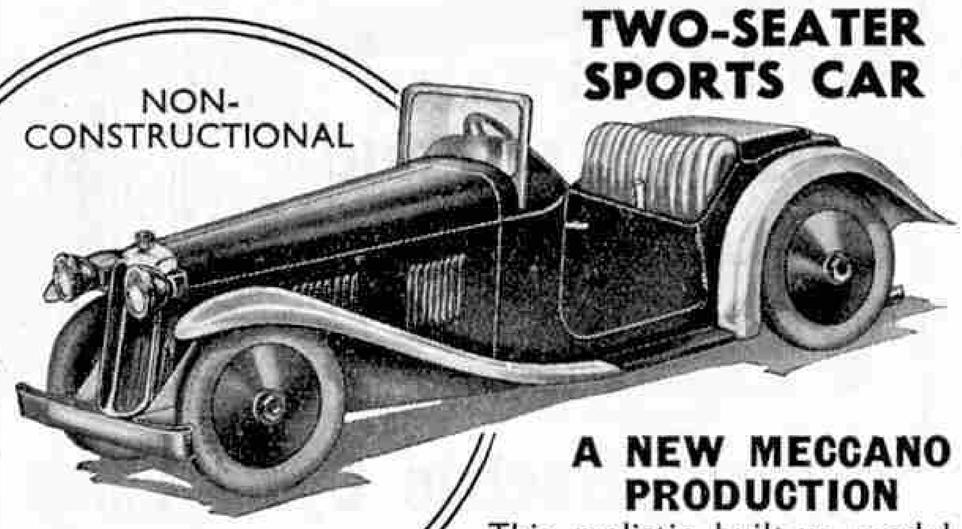
ON SALE EVERYWHERE

Published at
4, Bouverie Street
London, E.C.4

MECCANO

TWO-SEATER SPORTS CAR

NON-CONSTRUCTIONAL



A NEW MECCANO PRODUCTION

This realistic built-up model represents the modern sports two-seater, a type of car that combines speed and excellent road-holding qualities, and has become increasingly popular during recent years. Speed is suggested by the sweeping lines of the bodywork and mudguards, together with the sloping radiator and wind-screen.

The model faithfully resembles its prototype in all important respects. It is complete in itself, no constructional or assembly work being required. It steers from the wheel, and is fitted with a strong clockwork motor that gives a long and steady run.

Overall dimensions: Length, 8¼ in.; Width, 3¾ in.; Depth 2⅞ in.

Price **6'6**

The model is beautifully made and finished, and is available in three different colours—Red, Blue and Green

Manufactured by

Meccano Ltd., Binns Rd., Liverpool 13

Bluemel's

Battery
LAMPS
make splendid
Christmas Presents

"LITALITE"

These attractive moulded lamps give a brilliant, clean, safe light and make batteries last longer.
In various colours, 3/6.
White, 4/–.

"DUALITE"

Gives a brilliant red rear light or can be switched off and used as a reflector.
A great idea! 3/6.
White model 3d. extra.

Write for fully illustrated lists post free from Bluemel Bros. Ltd., Dept. 27, Wolston, nr Coventry.

For Instance, the Model Railway Transformer

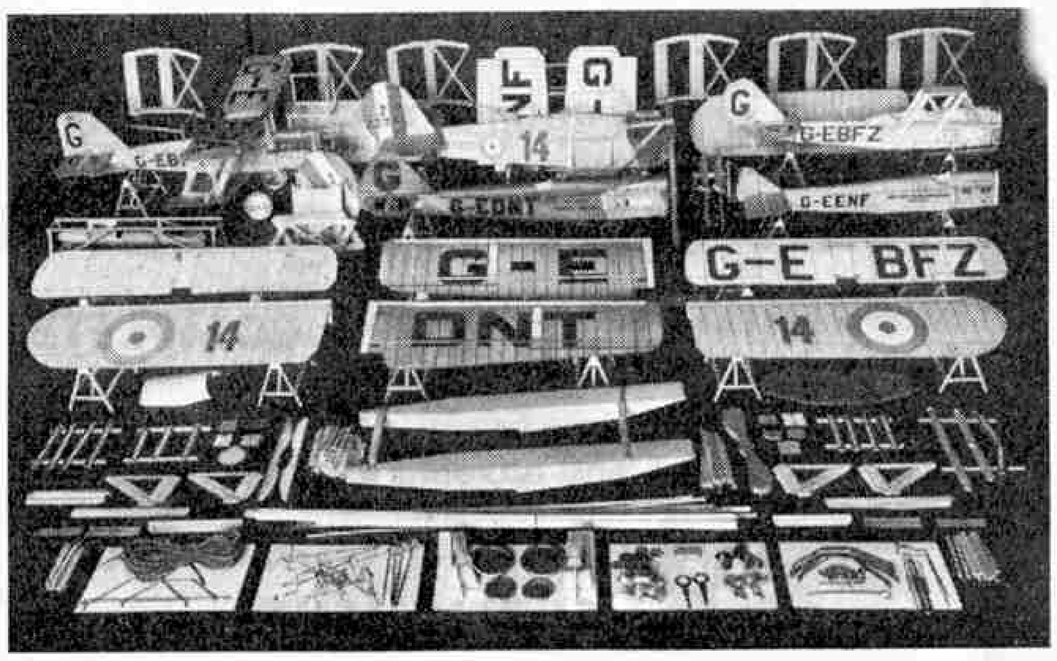
The Ferranti Model Railway Transformer will run your electric train or other electric models off the A.C. house lighting circuit with perfect safety, economically, and at a much less cost than that involved in the recharging and replacing of batteries.

Ferranti Transformers are suitable for all types of electric models except the permanent magnet type. For all standard supply voltages. PRICE **22'6**

Send for leaflet, and get one for Christmas.
FERRANTI LTD., HOLLINWOOD, LANCASHIRE.
TRANSFORMER BUILDERS SINCE 1882.

FERRANTI TRANSFORMERS

A Model Aircraft Factory in Miniature!



The most wonderful Model Aeroplane construction outfit ever offered. The illustration above shows models actually constructed from one of these wonderful boxes of parts, and covering an area of 20 sq. ft.

The largest model is 24 in. span, and there are plans, illustrated Books of Instruction, and material for making the novel little trestles shown.

When you have had hours of enjoyment erecting and rigging the models, you can fly them in-doors or out of doors. Some of the models rise off the ground under their own power, too! This offer is only possible by the fact that the boxes of parts have been made up from stocks seized under Debenture.

The sets are worth 25/– but are being offered for quick sale at

PRICE 5'-

CARRIAGE PAID U.K.

Carriage extra abroad. Allow for 3 lb. parcel.

Each Box varies slightly in the type of models enclosed, so you can make a bigger range of models if you get two sets at the special price of 9/– Carr. Paid.

SEND YOUR ORDER NOW to

JOHN GIBSON (Receiver), Model Aeroplanes & Toys Ltd (Dept. M)

36, CLAYTON STREET WEST, NEWCASTLE-ON-TYNE, 1

WARD, LOCK'S BOOKS FOR BOYS

The Wonder Books

10×7½. Picture Boards. 8 or 12 Colour Plates and hundreds of illustrations in tints. 5/– net.

New Volume.

THE WONDER BOOK OF

Do You Know?

Tells in picture and story of some of the most wonderful things in the world, many of them in our own homes.

THE WONDER BOOK OF

Aircraft

All about the wonderful machines that are daily making air travel more speedy and popular. Entirely New Edition.

Other "Wonder Books" constantly brought up to date.

MACHINERY.
PETS.
SHIPS.
EMPIRE.
THE WILD. Exploration and Big Game Stalking.
The BOYS' & GIRLS' WONDER BOOK.
SCIENCE.
INVENTIONS.
THE NAVY.
MOTORS.
WONDERS.
ANIMALS.
ELECTRICITY.
ENGINEERING WONDERS.
RAILWAYS.
NATURE.
SOLDIERS.
WHY & WHAT? Answers to Children's Questions.

Popular Scientific Recreations

By Professor A. M. LOW, D.Sc.

Fully illustrated. Wrapper in colour. 6/– net.

Here the well-known scientist describes hundreds of harmless and inexpensive experiments and tricks, and tells us the reasons for the phenomena that occur, also their application in our everyday lives.

The Handy Boy's Book

Cloth. 8½×6¼. 384 pages. Nearly 300 illustrations. 5/– net.

Includes hints on the following, and many other subjects: **Home Carpentry, Painting and Staining, Wireless Telegraphy, Boot Repairing, Lathe Work; Wood and Metal, Home-made Toys, Chemical Experiments, Model Aeroplanes, Model Locomotives, Cycles and Motor Cycles, Photography, Camping Out, Care of Pets, &c., &c.**

Boy's Book of Conjuring

Cloth. 7½×5. Fully illustrated. 3/6 net.

Comprising nearly 250 simple yet effective tricks with Cards, Coins, Handkerchiefs, Chemicals, Hats, etc., Parlour Tricks, Mesmeric and Magnetic Tricks, Shadowgraphy, etc., which may be performed by the veriest novice at a trifling cost. Nearly 200 Photographs.

All About Photography

Cloth. 7½×5. Fully illustrated. 2/6 net.

A most useful handbook describing this fascinating hobby in all its branches. Many diagrams and illustrations.

How to Play Hockey

By HARRY E. HASLAM.

Cloth. 7½×5. Fully illustrated. 2/6 net.

Complete Catalogue of Gift Books post free from

WARD, LOCK & CO. LTD., Salisbury Sq., London, E.C.4

IDEAL XMAS PRESENTS

From the "WILCO" Range

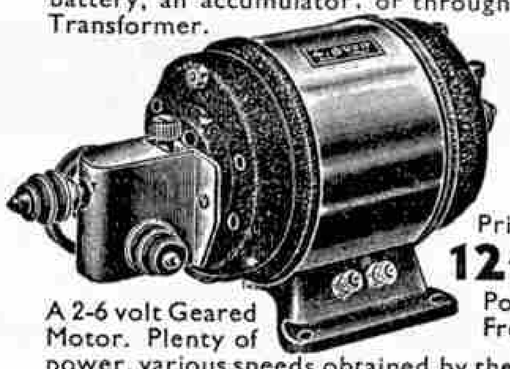
Price **23/-** Post Free.

DYNAMO LIGHTING SET

Penetrating light, chromium-plated, 2 Bulbs with control switch. Super 6-volt Dynamo running on ball bearings. Full details on request.

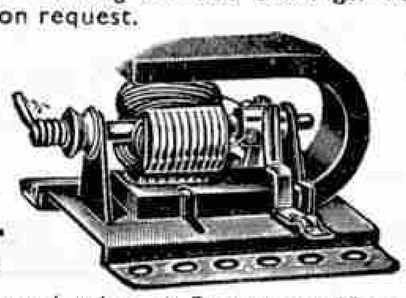
Price **5/9** Post 6d.

Very large powerful Motor. Works from a 4-volt pocket battery, an accumulator, or through our Transformer.



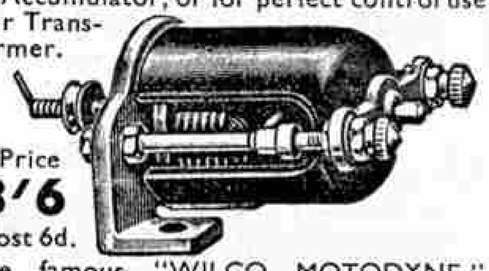
Price **12/6** Post Free

A 2-6 volt Geared Motor. Plenty of power, various speeds obtained by the five pulley wheels. Works off a 4-volt Battery, an Accumulator, or for perfect control use our Transformer.



Price **3/-** Post 4d

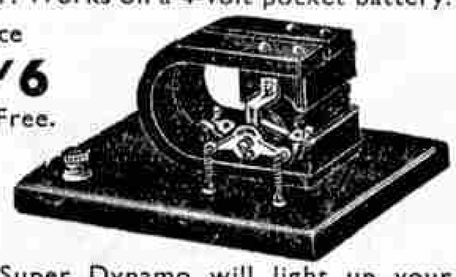
Here's good value. A Permanent Magnet Motor. Works off a 4-volt pocket battery.



Price **8/6** Post 6d.

The famous "WILCO MOTODYNE," suitable for models, speed boats, or as a Dynamo. Works on 4-volts and has a very low current consumption.

Price **14/6** Post Free.



Our Super Dynamo will light up your Models or Railway with SIX 3.5 volt Bulbs.

THE "WILCO" TRANSFORMER

With speed control, reduces 200/250 vt. A.C. to 2-8 volts. Capacity 3 amperes. Ideal for driving our motors off the Electric Mains at practically no cost. Will also light bulbs for Models and Railways, etc. Price **15/6**

All "WILCO" goods are obtainable from your local dealer or, in case of difficulty, direct from us. Complete 40 page Electrical Catalogue, 4d. Post Free.

L. Wilkinson, Dept. M, 8, City Rd., London, E.C.

NO HOME IS DULL *that has a* RILEY BILLIARD TABLE

8/- DOWN brings immediate delivery of a Riley "Home" Billiard Table. You pay balance as you play.

7 DAYS' Free Trial. Rileys pay carriage and take transit risks.

Hours of endless enjoyment may be spent on a Riley Billiard Table—enjoyment in which all the family can participate. Father, mother, boys and girls will be equally keen on this popular pastime. But it should be played on a REAL Billiard Table and not a toy. Play it on a Riley, every model of which is a perfect replica in construction of a full size Billiard Table. Sizes and prices of Riley "Home" Billiard Tables are shown below, also the easy monthly payments.

4 ft. 4 ins. × 2 ft. 4 ins.	...	£7	0	0	or in 20 monthly payments of	8/– 10/3 13/3 17/– 24/6
5 ft. 4 ins. × 2 ft. 10 ins.	...	£9	0	0		
6 ft. 4 ins. × 3 ft. 4 ins.	...	£11	15	0		
7 ft. 4 ins. × 3 ft. 10 ins.	...	£15	0	0		
8 ft. 4 ins. × 4 ft. 4 ins.	...	£21	10	0		

DINE AND PLAY ON THE SAME TABLE

The Riley "Combine" Billiard and Dining Table offers something unique in house furnishing, combining in one a beautiful dining table and a flawless billiard table. After dining, it is ready in a couple of minutes for a delightful game of billiards.

Available in many attractive designs, oak or mahogany, for cash or on easy terms. Here are the sizes and prices for the round leg mahogany pattern.

5 ft. 4 ins. × 2 ft. 10 ins.	...	£22	10	0
6 ft. 4 ins. × 3 ft. 4 ins.	...	£26	10	0
7 ft. 4 ins. × 3 ft. 10 ins.	...	£33	0	0
8 ft. 4 ins. × 4 ft. 4 ins.	...	£43	0	0

or in 13 or 20 monthly payments.

32 FREE BILLIARD TABLES. Write for details and free price list.

This is the Riley "Cabriole" design 6 ft. size, £34 10 0, or in 13 or 20 monthly payments.

Rileys are the largest makers of full size Billiard Tables in Great Britain. Also specialists in accessories, re-covering tables, etc.

WRITE FOR ART LIST.

E. J. RILEY LTD., Deal Works, Accrington

or Dept. 6, 147, Aldersgate Street, London, E.C.1.

WILL NOT WARP NOR LEAK; SOLID DRAWN.

BAILEY'S "SUPER" PUMP, Celluloid Covered (Made in Two Styles)

ONE WITH STEEL LINING at **2/–**, OR ALUMINIUM LINING at **2/3.** 15″ × ⅞″ SIZE.

The linings are SOLID DRAWN, cartridge fashion, each pump being drawn from its own metal blank, therefore there are NO solderings or loose pieces to leak. THIS IS THE *ONLY* SOLID CARTRIDGE DRAWN PUMP MADE ANYWHERE. DO NOT BE MISLED WITH IMITATIONS.

APEX ALUMINIUM ALLOY PUMP

drawn from the solid blank in our 200-ton presses like a cartridge.

In POLISHED OR BLACK ENAMELLED at **1/6** each for 15″ × ⅞″ Size.

If your dealer cannot supply, send the cash and we will send you the Pump you ask for by return

Apex Inflator Co. Ltd., Aldridge Road, Perry Barr, Birmingham

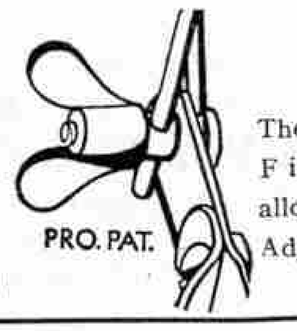
BAILEY'S PATENT "SUPER" CELLULOID MUDGUARD

INSTANTLY DETACHABLE AND ADJUSTABLE

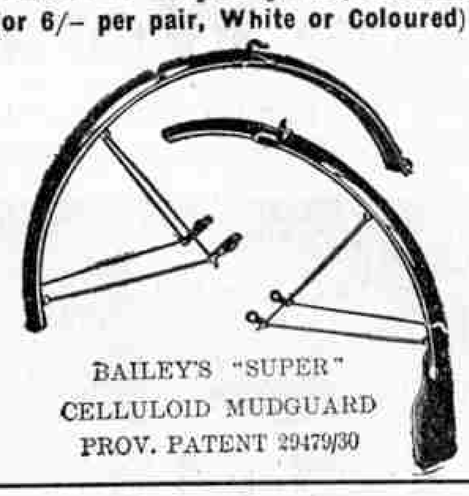
Extra Thick Celluloid
Extra Thick Flanges

ALL Steel parts are Electro Zinced before enamelling. VERY LIGHT, STRONG & RIGID. In 26″ and 28″ sizes for Round or "D" Stay or for Brazed Lugs.

Price 4/9 per pair, Black
(or 6/– per pair, White or Coloured)

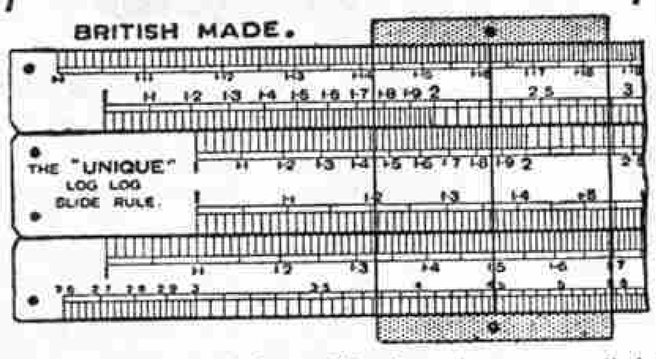


The Patent Fittings allow of 1″ Adjustments



BAILEY'S "SUPER" CELLULOID MUDGUARD
PROV. PATENT 29479/30

5/- "UNIQUE" SLIDE RULES 3/6



Ten-inch Slide Rule in polished mahogany, celluloid faced with log-log scale in addition to Scales A, B, C, and D. Flexible back. Aluminium framed, view free unbreakable cursor. Size of rule 11½ ins. × 1¼ ins. Well made and accurate. Supplied with case and full instructions, including Conversion Tables for Money Calculations. Price 5/– each (Post 3d., 3 post free). 5-inch model 3/6. (Postage 2d.) FREE GIFT of a set of 12 in Draughtsman's Scales with each 10-inch rule purchased during the current month.

3/6 The TECHNICAL SUPPLY CO. (M.M.) Norfolk Ho., Carden Av., Withdean, Brighton 5/-

---

Toy Casting Moulds for Lead Soldiers, Animals, Novelties. No experience necessary. Illustrated catalogue, stamp.—J. Toymoulds, 18, Kenyon Street, Birmingham.

We mean just what we say – this genuine SWISS Shockproof Watch, Dustproof case, Unbreakable Glass, Perfect Timekeeper, with 5 years' Free Repair Service—is yours **absolutely free,** just to introduce our Full size leakproof, leverless pressbutton filler—BRITISH Fountain Pen price 2/6 (post etc 6d.). Send NOW P.O. 3/- when BY RETURN you will receive this marvellous new Fountain Pen with our wonderful Gift Watch. No more to pay. Satisfaction or money back.

Wm. PENN (DEPT. B), 623, Holloway Road, LONDON, N.19.

WATCH ALBERT FREE!

with every **Shockproof Pocket Watch,** Koskopf Swiss lever movement (with signed guarantee), strong nickelled case, at only 4/6. No extra postage, and a solid leather Albert absolutely free. Order now from **A. J. HALES, Watchmaker, 27, Balmoral Rd., Andover.**

'AHOY!'

BRITISH SEA GAMES

Every Britisher is Sea-minded. That is why the 'AHOY' Series of British Sea Games is so universally popular—and why you should see them.

Obtainable from Hamleys, 200 202, Regent St., W.1, Army & Navy Stores, S.W.1 and all leading stores. Send for leaflet to the publishers:

ROBERT ROSS & CO. LTD., 2, Albion Terrace, Southampton.

DRAKE.—A fine game of skill, played with galleons and privateers. Quite difficult but well worth learning. **£1 0 0**

SHIP AHOY.—The Yacht race game which introduces the principles of real sailing. **10/6**

FLOTILLA.—An intriguing modern game of Naval manœuvres. Really new. **7/6 & 5/–**

ROUND THE ISLAND (of Wight) RACE.—Simple, but exciting and amusing. **2/6**

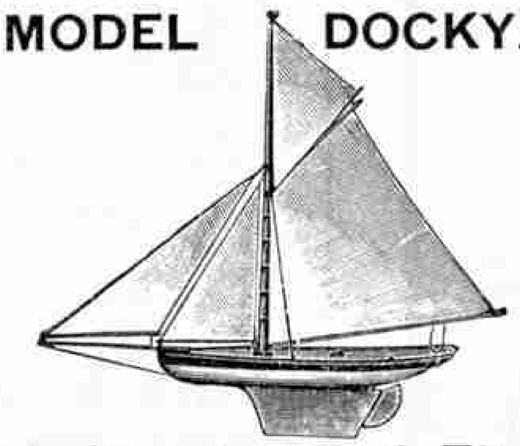
STOP PRESS

THE GREAT AIR RACE from ENGLAND to AUSTRALIA

2/6 net

A splendid new game.

KENSINGTON MODEL DOCKYARD



Sailing Yachts & Fittings

A LARGE STOCK KEPT OF ALL HORNBY & MECCANO GOODS
BOWMAN STEAM ENGINES
MECCANO DINKY TOYS
ELECTRIC TORCHES & MOTORS
AIR GUNS & AIR PISTOLS
SAFETY PISTOLS, REVOLVERS
ICE & ROLLER SKATES
FOOTBALLS, FRETWORK SETS
HOCKEY, CINEMATOGRAPHS
BOXING GLOVES
INGERSOLL WATCHES & CLOCKS

Boat List "M" Post Free

C. H. LORBERG
185, Kensington High St., London, W.8

The Schoolboy's Diary

During the holidays or term you need a diary to record your doings and engagements, your friends' addresses, sports results, homework and prep. The book contains many pages of French, German, Latin and Greek Verbs, Tables for Maths., Chemistry, Sports, etc.

In Cloth 1/–
In Leather Cloth, with pencil 1/6
In Leather, with pencil and pockets ... 3/–

The Wireless Listener's Diary

As an aid to listening, as also to all technical enthusiasts, this diary is indispensable. It contains space in which to jot down the Condenser Readings of the chief Stations, articles upon Maintenance, Broadcasting, Television, etc.

Cloth ... 1/– Leather, with pencil, etc. ... 2/6

The Boy Scout's Diary

Compiled at Headquarters, and issued with the approval of Lord Baden-Powell. It is just chock full of helpful hints and scouty gadgets and is well illustrated.

Cloth Cover ... ... 9d. with pencil 1/–.
Leather, with pencil, pockets and notebook 2/6

The Motor Cycling Diary

Published in Conjunction with "Motor Cycling," it is cram full of helpful information and practical hints.

Cloth 1/–
Leather, with Pencil and Pockets 2/6

The Cyclist's Diary

Published in conjunction with The C.T.C. it has many pages of information and records.

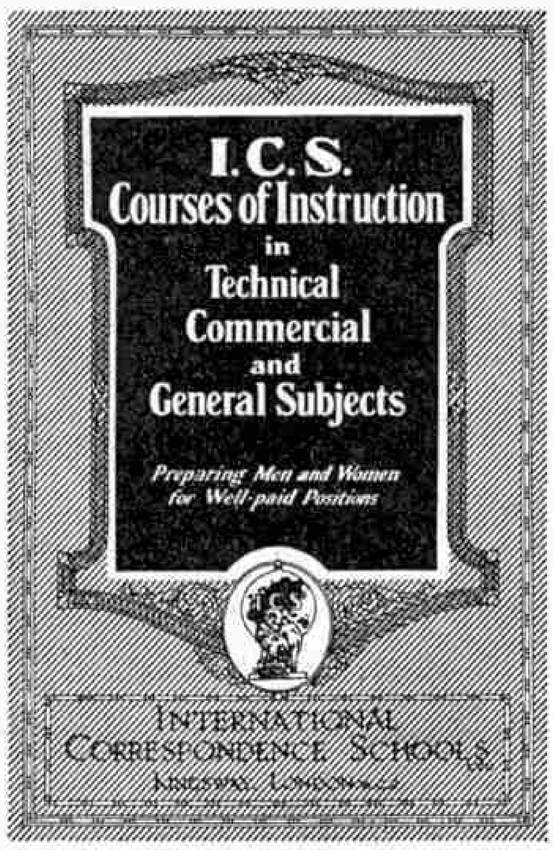
Cloth ... 1/– With Pencil ... 1/3

OF ALL STATIONERS, BOOKSTALLS AND STORES

THEY ARE

Charles Letts's

A FREE I.C.S. BOOKLET
THAT CONCERNS YOUR FUTURE



Most young men make a slow start in life, and have to wait a long time for promotion, because they have no special knowledge of the sphere of work in which they are engaged.

There is only one way to avoid that; the way of spare-time specialised vocational training. The International Correspondence Schools have been giving such training for 43 years and have enrolled more than 4,500,000 students, hundreds of thousands of whom have won substantial success.

This booklet is comprehensive. It explains the I.C.S. method in detail, and gives brief particulars of all I.C.S. Standard Courses, covering practically every branch of commerce and industry and many professions. Twenty-four other I.C.S. booklets, each dealing with one group of Courses, contain everything the ambitious man would wish to know about the particular Course or Courses that meet his individual needs.

Our 25 booklets, averaging 54 pages each, are entitled as follows:

I.C.S. Courses of Instruction

Advertising	Marine Engineering
Aeronautical Engineering	Mechanical Engineering
Agriculture	Mining
Architecture & Building	Motor Engineering
Art for Commercial Use	Radio
Chemical Engineering	Railway Equipment and Running
Commercial Training	Salesmanship and Window Dressing
Civil Engineering	Scientific Management
Domestic Engineering	The Services (Civil, etc.)
Electrical Engineering	Textile Manufacturing
General Education	Woodworking
Languages	
Lettering & Showcard Writing	

(These booklets include the preparatory Courses for the various Examinations.)

If you wish to make a real success of your life, write for any one (or more) of our booklets. It is free. So also is our expert advice on any matter relative to your career.

International Correspondence Schools Ltd.,

218, International Bldgs., Kingsway, London, W.C.2.

CYCLING WITHOUT A VEEDER IS LIKE LIVING WITHOUT A WATCH

Insist upon the genuine

Fit a Veeder

A new interest awaits you if you fit a "Veeder." It tells you to a fraction how far you've travelled—how far to go. The exact mileage from one place to another—the entire distance covered—service your tyres give—are to mention only a few things every cyclist ought to know.

Prices—Regular, all sizes ... 7/-
Trip, all sizes... ... ... 15/6

Sole Importer: **F. E. DICKINSON, St. Andrew's House, Holborn Circus, LONDON, E.C.1.**

By Appointment

ASK FOR

Crawford's Rover Assorted

A CHOICE SELECTION
- OF SWEET AND -
SEMI-SWEET BISCUITS
FOR GENERAL USE

SOLD EVERYWHERE
ASK FOR THEM!

CIGARETTE CARD COLLECTORS

OUR NEW 1935 CATALOGUE OF 1,200 SERIES is **Free and Post Free.** Send at once.

"THE CIGARETTE CARD NEWS."
Always something fresh about the hobby. Monthly. Single Copy, 2½d. Six Months, 1/3.

We are exhibiting at
THE SCHOOLBOYS' OWN EXHIBITION,
Horticultural Hall, Vincent Square, London, S.W.1. Dec. 26th to Jan. 5th, 1935. Don't forget to visit our stand.

The London Cigarette Card Co. Ltd.,
Room E,
Cambridge House, Cambridge Road, Chiswick, London, W.4.

HERE IT IS
THE ONE CATALOGUE INDISPENSABLE TO ALL

NEW 1935 EDITION NOW READY

Contains full technical details and illustrations of the whole range of

BULGIN QualityComponents.

The largest range in the world.

Home Constructors and Radio Engineers will find this handbook an invaluable guide to the best apparatus for modernising, building, or repairing any type or make of radio receiver.

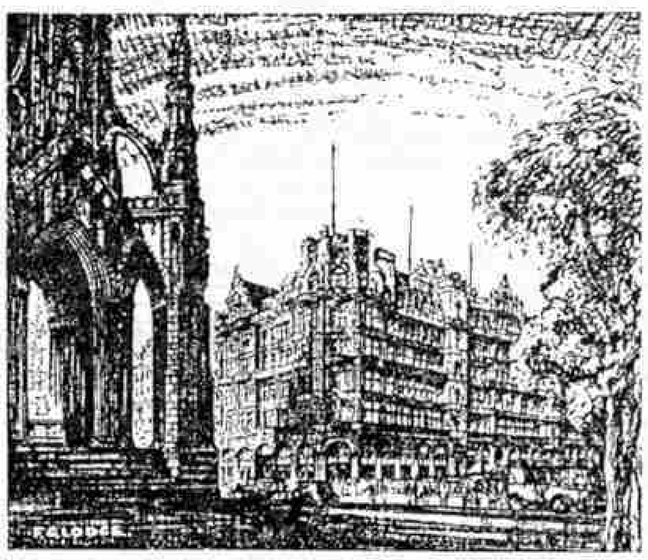
300 Illustrations. 50 New Lines. Send for a Copy Now.

A. F. BULGIN & CO. LTD.,
ABBEY RD., BARKING, ESSEX.

Please send me post free, a copy of the New Bulgin 80 Page Catalogue No. 154 "D," for which I enclose THREEPENCE IN STAMPS.

NAME.....

ADDRESS .....
(Block letters, please)



JENNERS
PRINCES STREET EDINBURGH
LIMITED

EDINBURGH
AGENTS
for MECCANO and
Hornby Trains

■

A complete stock of all
Hornby Train Accessories and
Meccano Parts

The Academy Series of INTERLOCKING JIG-SAW PUZZLES

A FINE RANGE OF PUZZLES
6d. to 63/–.

Here illustrated is a figure from one of our

INTERCHANGEABLE PUZZLES

THE LATEST NOVELTY

Three different boxes:

THE BRUIN BOYS ...	**2/11**
Cook and The Policeman	**2/11**
THE MAD TEA PARTY	**3/6**

All figures in each puzzle have interchangeable Hats, Heads, Bodies and Legs.

WRITE FOR FREE ILLUSTRATED LIST

The CRYSTAL MAZE

A Celluloid Puzzle, not a Jig-Saw, 1/– each in assorted colours.

J. SALMON LTD. (Dept. M.), Puzzle Makers, Tubs Hill Works, SEVENOAKS.

DIXON'S of DUBLIN

Carry full stocks of **MECCANO PRODUCTS** and invite all boys to see their display when visiting Dublin.

JAMES L. DIXON,
14, Suffolk Street, Dublin, I.F.S.

MINIATURE ADVERTISEMENTS

for Model Railway Stations gratis and post free on application to TINY-ADS, c/o Pratt & Co. (Advertising) Ltd., 329, High Holborn, London, W.C.1.

WE BUY, EXCHANGE & SELL

MODEL LOCOMOTIVES in Steam, Clockwork and Electric, **Trucks, Coaches, Track Points, STEAM ENGINES, ELECTRIC MOTORS,** etc. **"I am more than satisfied with my exchange of locos,"** writes a customer. **YOU** too, should use our service. Send **4½d.** for our December catalogue of **USED BARGAINS** with particulars.

Central 'Handi' Supplies, 11, Friars Street, Ipswich.

Britain's First ROCKET MAIL

SPECIAL FREE SOUVENIR of first firing given in this unique packet, with beautiful mint **PICTORIAL "TOWER BRIDGE" STAMP** which was used on Rocket envelopes. Also **26 FINE AIR-MAIL STAMPS,** Indo-China, Persia, Spain, Morocco, etc., and **100 OTHER STAMPS** of the World. All for **10½d.** post free.

R. PARKER, 4, Compton Mansions, Compton Street, London, W.C.1.

Standard Films. Electric Home Cinematographs, cheap. Lists—"Pictures,"109, Kenlor, Tooting, London.

CIGARETTE CARDS FOR SALE. All pre-war and modern sets for sale—also thousands of mixed cards—send 1½d. for 20-page catalogue.—Jack, 21, Gunnersbury Crescent, London.

Birds' Eggs, Butterflies, Cabinets and Apparatus. Lists free.—Forbes, Dept. M., Clutton, Chester.

Patents for Inventions, Trade Marks: "Advice Handbooks" and Cons. free. B. T. King, Regd. Patent Agent, 146a, Qn. Victoria St., London, E.C.4. 49 years' refs.

Midland Model Co. Block Telegraph Instruments. Reduced 14/– to 12/– per pair. Get yours from—H. J. Farmer, 36, Lancaster Road, Rugby.

REALLY SMART. Half Horse-power Petrol Engine Castings, only 9/9. Part Machined. Catalogue 3d.—Butler Foundry, Wade Street, Littleover, Derby.

CINEMATOGRAPHS British Made from 37/6
CINEMATOGRAPH FILMS

Standard size only. Write for our Catalogue, post free. Sample Film and Catalogue 1/– and 2/6.

Filmeries Co., 57, Lancaster Rd., Leytonstone, E.11.

Any of these Jolly Games will make the Party go with a swing! Order Now

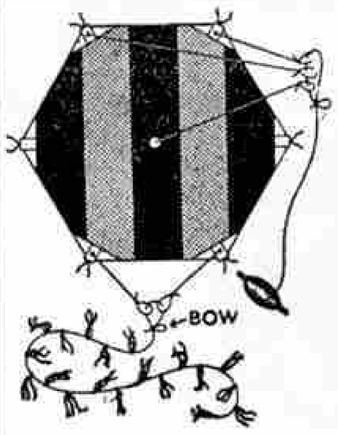
'GEOG' A Geographical Game giving unbounded fun. Any number can play. Very suitable as Xmas Gifts. Approved by Educational Authorities. Price **2'6**

'BAD EGG' Greatest fun-provoking game yet produced. The efforts of the players to control the eccentric balls set everyone howling. Get one for the Xmas Party. Price **1'6**

'JAM-WALLA' Crazy 25 pieces. Placing these in correct order is intriguing and fascinating, with £125 Cash Prizes for the solution. Closing date Jan. 31st, 1935. Price **6d.**

From Toy Stores, etc., or direct from

GEOG GAMES 126, Rusholme Road Ardwick, Manchester



The ATALANTA KITE

complete with Buzzer, Flying String and Tail.

KITES (Folding)	18″	30″	36″
Price	2/6	4/9	6/9
Postage U.K.	4½d.	9d.	9d.

Flies to the highest altitude and describes wonderful evolutions.

The colours of the 18″, 30″ and 36″ Kites can be changed by the user in one minute.

The Buzzer produces a pleasant humming sound at the will of the Flyer.

See the name **"Atalanta"** on every Kite. Illustrated Leaflet sent post free.

Sole Manufacturer, Inventor & Patentee:

S. X. PANTCHEFF

152, Queen's Road, Buckhurst Hill, Essex

Readers in York and district will find full stocks of Meccano products at

PICKERINGS

28, High Ousegate, YORK

Meccano Outfits, Hornby Clockwork and Electric Trains and Accessories, Kemex and Elektron Outfits, Dinky Toys and the New Dinky Builder.

Also Constructions, Skybirds, Bowman Steam Engines, F.R.O.G. and Warneford Aeroplanes, Lott's Bricks, etc., and all the latest indoor Games.

BOOKS FOR CHRISTMAS

We invite "M.M." readers to order from us their Christmas Books, Coloured Plates of Locomotives, Clipper Ships, Railway, Aeroplane and Nautical Jig-Saws. Send for List XL1.

Railway Photographs, 9, Union Court, Liverpool 2.

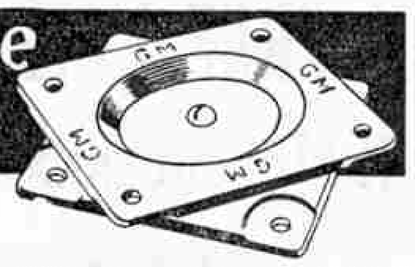
BUTTERFLIES, BIRDS' EGGS, PLANTS, etc.

Write for full Catalogue of everything necessary for the Collector. Post free per return. Advice freely given.

Trophy Mounting a Speciality.

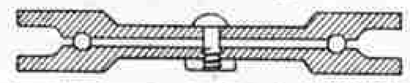
WATKINS & DONCASTER, Dept. M.B., 36, Strand, London, W.C.2 (P.O. Box 126).

Ball Race TURNTABLE



A REAL ENGINEERING PRODUCTION.

Fits Constructional Toys: MECCANO, TRIX, etc., etc.



Section view showing Ball-bearings (45 of Hardened Steel)

YOU MUST HAVE a firm, rigid turntable when building your Crane or Swing Bridge. The "G.M." Turntable is GUARANTEED to turn **56 lbs.** Strong and accurately made, it is the best you can buy and costs only

From your Local Store or Toy Shop. **1'6** Each.

COMPETITION for adaptability of the Turntable open to purchasers only. Several valuable prizes. Particulars enclosed with each article. If any difficulty of supply write to us for your nearest dealer.

G. M. PATENTS CO.,
26, NEW BUILDINGS, PRICE ST., BIRMINGHAM.

THE RAILWAY MAGAZINE

PRINCIPAL CONTENTS DECEMBER ISSUE

Centenary of Irish Railways.
Modern Locomotive Work in France: V-P.L.M. Railway.
Cambridge as a Railway Centre.
The Southern Railway in the Isle of Sheppey.
An 1859 Design Locomotive at Work To-day.
The Development of Railway Air Services.
The Travelling Post Office.

The above are in addition to the regular features such as "British Locomotive Practice and Performance" and "The Why and the Wherefore."

THE RAILWAY MAGAZINE

MONTHLY Illustrated ONE SHILLING

33, TOTHILL ST., WESTMINSTER LONDON, S.W.1

10,000 MOTORS, Spring and Electric, for Radio-Grams or **GRAMOPHONES,** in stock. Thousands of components; Tonearms, Soundboxes, Pick-ups, horns, pedestal-portable cabinets, hinges, lidstays, springs, gears, repairs. Portables from 18/–. Violins, accordeons, etc. 64 page cat., how to make them, 2d. 1935—70 page Radio Cat. 4d. Established 30 years.

The Regent Fittings Co., D78, 120, Old St., London, E.C.1.

WEBLEY AIR PISTOLS

Marvellously accurate for target practice.

No license required to purchase.

Senior 45/-, Mark 1 30/-, Junior 20/-,

Write for List. WEBLEY & SCOTT LTD., 87, WEAMAN STREET, BIRMINGHAM, ENG.

Send to FOYLES FOR BOOKS!

New and second-hand books on every subject. Over two million volumes in stock. Catalogues free on mentioning your interests.

119-125, Charing Cross Road, London, W.C.2.
Telephone—Gerrard 5660 (seven lines).

READERS' SALES

Forty-five "M.M.'s," November 1930–May 1934. Two others. Perfect condition. Complete 13/–, or offers.—J.P.C., 26, Dacre Park, S.E.13.

For Sale. Constructments No. 100, new, unused. Apply—Smith, 7, Dolphin Road, Maxwell Park, Glasgow.

Sale. 1½ in. Spark Coil, 10/–.—Boileau, Manor House, Tonbridge, Kent.

Wanted. Small Punt or Flat Bottomed River Boat. —Barton, 3, Monkton Hill, Chippenham, Wilts.

Wanted. Films 16 mm. Particulars—Hall, 7, Ashburn Grove, Stockport.

Sale. "M.M.'s," 1929-30. "Hornby Train Books," 1927-32. Good condition. Offers.—Platt, 60, Brighton Road, Aldershot.

Wanted. "Magnets," 1931-1932, good condition, reasonable price. Please write—Brook, Coningsby House, Hereford.

325 "Modern Boys" for sale. Perfect condition. 15, 1/–. 100, 5/–. Set 12/6.—Truelove, Baron's Court, London, W.14.

Sale. "M.M.s" Oct. 1928–Dec. 1934. What offers? "Chums" and other annuals. Send for list.—Behets, 3, Elm Gardens, Welwyn Garden City, Herts.

Sale. Soldiers and Gun, 3/9. Bing Railway, gauge OO, list.—Owen, 21, Church Road, Gillingham, Kent.

Sale. Junior Bicycle, 18" rim. Good condition. 27/6.—Goodwin, 4, Cressida Road, London, N.19.

Wanted. Pathé Kid Projector and Films. Good condition, cheap.—Emery, Thorneycroft Avenue, Burslem, Staffs.

Stamp Collection. 2,000 stamps, suitable for beginner, £1, bargain.—Machan, 40, Daleswood Avenue, Whitefield, Manchester.

Stamp Collection, over 500, album, 2/11; about 5,000 duplicates, unsorted 4/11.—Hutchinson, 66, Lockyer Avenue, Burnley.

For Sale. 12-volt Bing "Apollo" Electric Loco and Tender, 10/6; also Transformer to operate same, 10/–. 6-volt Permanent Magnet type Central London Loco, 7/6. Or 25/– the lot.—Holloway, 11, Cavendish Avenue, Sevenoaks, Kent.

Sale. Leather-bound album and collection 800 different stamps 4/–. 26 inch Kite 2/–. Duplicating Slab and Ink 2/6. Shocking Coil 2/–.—Webb, 67, Amherst Road, Hastings.

Splendid Stamp Collection over 1,000 different in album, 6/–.—Anneak, 1, Edith Villas, W.14.

For Sale. Electric Railway. Scientifiction Magazines. Toy Howitzer. Good condition. Write, particulars.—Holloway, "Wybourne," Slewins Lane, Romford, Essex.

"M.M.'s" 1929, 1930, 1931, 1932 complete, good condition; 3/6 per year, post free.—Walker, 27, The Grove, London, N.W.11.

Bargains: 17½ ozs. New Billiard Cue 23/6; 25" Motor Boat 7/6; Bowman Steam Engine 9/6; Punch-ball 10/6; 5-valve Portable Radio 50/–; or nearest offers. Bottomley, Springfield Lane, Morley, Leeds.

Quantity gauge O track, wooden sleepers, also tinplate, eight points, three clockwork engines, numerous coaches, trucks, tunnel, buffers, accessories. Bargain £5 plus carriage. Cost very much more. Also Bowman stationary engine, cost 32/6, little used 12/6. Details—Mayo, 89, Mount Road, Birkenhead.

⅝" bore, 1¼" stroke, Stuart Engine, Babcock boiler, feed pump and Stuart dynamo. Excellent running order, £3 15s.—Parnell, 82, Second Avenue, Gillingham, Kent.

Sale. "M.M.s" Jan. 1931–Dec. 1933 8/6. Hobbies combined Lathe-Fretsaw 25/–. Horizontal Steam Engine. Excellent condition 25/–. Rolling Stock, Rails, etc. Send for list.—Sheppard, 12, Newton Grove, Leeds.

Christmas Bargains: Model Railways. Fort and Soldiers 10/–, large Farmyard 35/–, fine Terminus Station 50/–, "M.M.'s" Jan. 1925–Feb. 1927 7/6, also Jan. 1931–Aug. 1933 7/6, 13a Set Anchor Stone Blocks 30/–. Aeroplane Constructor set, 10/–.—Smith, Undertaker, Staines.

Sale. Bowman Engine, 5/6; Warneford "Demon," 4/6; Modern Boys, 1-310, Wenebrik, 2-valve Radio, Home Laboratory, 100 Chemicals, Apparatus. Offers? —J. Bearon, 38, Maxwell Street, Crewe.

For Sale. Model Railway, Three Locos, Goods, Passenger Stock, Track. Cost over 10 guineas. Good condition, 85/– or offer.—Martin, 63, Tressillian Road, Brockley, London.

Fifty 100 ft. Standard Films; Mystery 6d., Western 6d., Sport 8d., Comics 9d.; Postage 4d., Two 5d.; Cinematograph, 2/6; Forty 30 ft. 9.5 mm. Films (Educational), 10d. each, Comics 1/4; 60 ft. 3/–, Postage paid.—R. Hobbs, 20, Manse Brae, Glasgow, S.4.

Sale. Gauge O Track, Rolling Stock, etc., 8 Locos. Perfect condition, cost £27. Accept £10 or offer.—12, Mayfield Road, Sutton, Surrey.

Stamps. Selling collection, 100, 2/–. 250, 4/6. Excellent value.—M. A. Walker, 1, Park Cres., Wolverhampton.

Sale. Bowman 30/– Locomotive, Tender, Carriage and Set of 12 Lines, used twice. Cost £4. Accept £2.—G. Swift, Bank, Bidford-on-Avon, Warwickshire.

Sale. Bing Electric Speedboat, as new. Cost 21/–, take 12/6. Home Cinema (Standard), number of Films. Cost 10/6, take 5/–.—D. Irwin, 36, Drakefield Road, Balham, London.

Sale. Speed Boat Hull. Length 35½ in., Beam 8¾ in. Polished Deck. Brand New. 10/6 Post Free.—"Devonia," Cedars Avenue, Mitcham, Surrey.

This Month's Special Articles

	Page
A Trip on the "Night Scotsman" ...	972
Air News	968
Books to Read	986
Chemical Conjuring Tricks	990
Clock Without a Dial	962
Collecting Meccano Dinky Toys ...	996
Competition Page	1035
De Havilland "Diana" Air Liner... ...	970
Development of the Railway Ticket ...	993
Engineering News	950
Fireside Fun	1033
Flying and Burrowing Junctions... ...	981
From Our Readers	982
Fun with Elektron Outfits	994
Great Ports. XII—Montreal	956
Guild Pages	1017–1019
Home-Made Electric Motor	999
Hornby Railway Company Pages	1021–1027
Irish Tomb as Old as the Pyramids ...	984
Leicester and Swannington Railway ...	978
Machinery of the Royal Mint	948
Meccano Electric Lighting Set	1013
Meccano Printing Machine	1003
Model-Building Contest Results	1007
Model-Building Contests	1001
Model-Building with the New Meccano ...	1004
Of General Interest	954
Puzzle Your Sharp-Eyed Friends ...	959
Railway News	974
Railways of Switzerland—III	976
Removing Dust from Gases	952
Romance of Salt	966
Second Dutch War—III	964
Stamp Collecting	1029
Stamp Gossip	1031
Suggestions Section	1010
World's Largest Canal Lift	946

COLLECT R P PHOTOS.

The new hobby—collecting real photographs of Trains, Aeroplanes and Ships—is both interesting and instructive. Send postage for free booklet "How to Collect." All our photographs are postcard size and are the work of experts. The price is 3d. each, or 2/6 per dozen post free.

RAILWAY PHOTOGRAPHS

New List Now Ready

We have pleasure in announcing that our new catalogue is now available. Over a hundred new titles have been added and all engines are now classified. Send 2d. for specimen photograph and catalogue R14.

Special offers during December to new clients.
Set No. X1. Six L.N.E.R. "Scotsmen," 1/2
Set. No. X2. Six L.M.S. "Royal Scot," 1/2
All different and all post free.

AEROPLANE PHOTOGRAPHS

Wonderful photographs of all types of Civil and Military aircraft, on the ground and in flight. Many by staff photographers of "The Aeroplane" and "Flight," by arrangement. Send 2d. for specimen photograph and list A2 containing over 200 titles.

Special offers during December to new clients.
Set X3. Six Bombers, 1/2.
Set X4. Six Air liners, 1/2.
All different and all post free.

PHOTOGRAPHS OF SHIPS

Real photographs of famous liners (including "Queen Mary"). List of twenty-four titles free on application.

Special offer during December to new clients.
Set X5 Six Famous Liners, 1/2 post free.

Flag Sheet showing flags and funnels of over 400 British Shipping Companies. Paper 1/9, Cloth 3/9 post free.

Collectors' Cabinets (to hold 500 postcards) from 2/9. Postcard albums for 100 cards 2/– and 2/6; 200 cards 3/3; 4/3 and 6/–; 300 cards 4/9 and 9/6. All post free. Send for full list No. XL1.

REAL PHOTOGRAPHS CO.

9, UNION COURT, LIVERPOOL 2.

Sale. Gauge O Railway, Four Locos, Rolling Stock, Rails, Points, etc. As new. Bargain. Lists on application.—Jamieson, 97, Bo'ness Road, Grangemouth, Stirlingshire.

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE :—
LIVERPOOL 13, ENGLAND.
Telegrams : "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/2 per copy (postage extra), and the subscription rates 8/– for six months and 16/– for 12 months (post free); Canada, where the price is 10c. per copy, and the subscription rates 65c. for six months, and $1.25 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the United Kingdom and Northern Ireland. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA : Meccano Ltd., 34, St. Patrick St., Toronto.
UNITED STATES : Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA : Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND : Models Limited, Third Floor, Paykel's Buildings, 9, Anzac Avenue (P.O. Box 129), Auckland, C.1.
SOUTH AFRICA : Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA : Karachi: Daryanamal and Bros., Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta : Bombay Sports Depot, 2, Lindsay Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

The WEBLEY SERVICE AIR RIFLE, Mk. II.
No Licence required to purchase

WRITE FOR DESCRIPTIVE FOLDER

Rooks, Rabbits, Rats, Sparrows and similar vermin can be destroyed by this extremely accurate and powerful Air Rifle
Ideal for Target Practice.
Calibre 22 or 177 With Leafsight and Peepsight.
WEBLEY & SCOTT, Ld. 87, Weaman St., BIRMINGHAM 4

INDEX

Vol. XIX

Jan.—Dec., 1934

Admirals, Famous British:—Lord Nelson, 267; Lord St. Vincent, 4
Aero Engines:—British, Fine Records of, 463; D.H. "Gipsy Six," 282; Napier "Rapier" series, 203.
Aeroplanes:—Airspeed "Courier," 284; Airspeed "Envoy," 864; American Civil and Military, 120; Automatically piloted, 25; Blackburn Civil Monoplane and Biplane, 376; Blackburn "Segrave," new form of, 203; Cierva "Autogiro," 1, 25; D.H. "Comet," 968; D. H. "Diana," 375, 970; D.H. "Leopard Moth," 122; Farman "390," 24; Fokker F.XX and F.XXXVI, 780; Foreign Commercial, 26; French and German Marine, 464; French Cabin Monoplanes, 204; Giant Russian Monoplane, 282; Gloster "Gauntlet," 621, 703; How an Aeroplane is Flown, 622; Imperial Airways, 866; Low Wing Monoplanes, 704; Navigation by Radio, 540; Short, 621, 866
Aircraft Carriers:—British, 522; Swedish "Gotland," 24
Air News, 24, 122, 202, 282, 374, 462, 540, 620, 702, 778, 864, 968
Air Races, MacRobertson, 374, 761, 968
Air Travel in Great Britain, 542
Armourplate Glass, Marvels of, 696
Artificial Silk, Story of, 110, 193, 298

Bag Filling Machine, Cement, 274
Bean, Mexican Jumping, 461
Bekonscot Model Village and Railway, 304
Bells, England's Great, 530
Books to Read, 36, 124, 218, 300, 400, 474, 562, 642, 716, 782, 888, 986
Borobudur, Buddhist Temple of, 684
Bowls, Story of, 369
Bridges:—Barendrecht, Holland, Vertical Lift, 608; Chelsea Suspension, 450; Harpers Ferry, U.S.A., 398; Kalabagh, India, 764; Modernising Modder River, 611; New Forth, 107; New Jersey 3½-mile, 281; Rochester's Famous, 200; Sagainga, Burma, 451; Solway Viaduct, 785; Traneberg, Stockholm, 950; Victoria Tubular, Montreal, 535; Waterloo, 446; Westinghouse Memorial, 451, 524
Bush Differential Analyser, The, 441, 442

Calgary Stampede, The, 612
Canal Lift, Niederfinow, 946
Casting Plant, S.R. Continuous, 384
Castings, Sand-Blasting of, 449
Caves, Exploring Mendip, 104
Chemical Magic at Home, 46, 142, 227, 313, 403, 794, 882, 990
Chemistry, Special Articles:—Chemistry applied to Ship Repairing, 482; Gold, 141; Pioneers of Chemistry, 311, 796; Wealth from Waste, 45
Chess Players, A Village of, 20
Cinema Theatre, The Modern, 6, 116
Clock, Paddington Station, 962
Clouds, Rain and Dew, 112
Compass, Magnetic, How developed, 792
Competition Pages, 79, 169, 251, 341, 431, 507, 583, 667, 745, 833, 921, 1035
Competitions, Hornby Railway Company, 73, 164, 246, 330, 421, 501, 581, 663, 738, 825, 913, 1027
Cranes at Middlesbrough Docks, Level Luffing, 275
Conjuring Tricks for Christmas, 959

Dams:—Boulder (Hoover), U.S.A., 1, 98, 186, 682; Hume, Australia, 950; Metur Cauvery, 606
Drag Scraper and Ropeway at Paper Mill, 855
Drawing, Art of, 220
Drilling Machines, Continuous, 693
Dutch War, Second, The, 303, 776, 860, 964
Dynamometer, "Froude" Hydraulic, 39

Earth's Magnetism, Studying the, 604
Easter Island, Mysteries of, 119
Editor, With the:—Are Thinking Machines possible? 441; "Blue Riband" of the Atlantic, 849; Christmas Toys of Thirty Years Ago, 945; "February Fill-Dyke," 97; Greenwich and the Prime Meridian, 761; Jacquard, Pioneer of Modern Loom, 601; Machinery and Unemployment, 681; Madame Curie, First Great Woman Scientist, 601; May Day, 353; Meccano aids Scientific Research, 441; Nation's Water Supplies, 185; Newcomen Engine in America, 521; Our Dangerous Roads, 353; Prime Minister's Interest in Hornby Trains, 265; St. Swithin's Day, 521; Ten Years' Progress in Air Transport, 265; Treasure Hunting—New Style, 681; Wireless Service with 6½ in. Waves, 185; World's Greatest Motor Show, 849
Electricity, Special Articles:—Electricity in the Home, 42, 138, 222; Electro-Magnets, 885
Elektron Outfits, Fun with, 40, 136, 137, 791, 887, 994
Engineering News, 10, 106, 276, 450, 608, 766, 950

Fireside Fun, 81, 167, 249, 335, 425, 505, 585, 665, 743, 827, 915, 1033
Floating Dock, Wellington, 106
Forest Fire Control, Radio helps in, 555
From Our Readers, 28, 126, 214, 296, 382, 478, 558, 634, 708, 798, 868, 982

Gases, Removing Dust from, 952
G.W. Railway:—Electric Train Indicator, Paddington, 387; Heavy Oil Rail Cars, 631; Numbers for Famous Trains, 631
"Grid" across the Thames, Carrying the, 3

Hailstorm Millions of Years Ago, 639
Hornby G.W.R. No. 2 Special Locomotive, 65
Hornby Railway Company, Branch Notes, 67, 159, 241, 327, 417, 497, 577, 655, 735, 819, 907, 1021
Hornby Railway Company, Junior Section:—First Steps with a Hornby Railway, 333, 423, 657; Hornby Trains in the Garden, 661; Installing a Hornby Electric Railway, 165; Loading Gauges, Real and Model, 245; Model Railway Rules, 820; Preparing for Heavy Traffic, 910; The Appeal of a Miniature Railway, 1024
Horse Power, Brake, Measuring, 39
How to Get More Fun, H.R.C. Articles:—American Hornby Trains, 498; Commencing the Railway Hobby, 162; Freight Services, 736; Hornby Locomotive Wheel Arrangements, 418; Installing a Miniature Railway, 908; Interesting G.W.R. System, 658; L.N.E.R. (Gt. Central) Train Working, 68; Miniature "Tilbury" Trains, 328; Mixed Traffic, 1022; Realistic Traffic Working, 242; Summer Traffic Features, 578
Hydraulic Apparatus, Modern, 762
Hydro-Electric Plants:—Beauharnois, Canada, 278; Tezcapa, Mexico, 610; Trolhattan, Sweden, 2

Insects:—As Engineers, 458; Marvels of Ant Life, 19
Iraq Pipeline, Laying 1,200-mile, 198

Jet Disperser, "Glenfield," How it Works, 850

Knitting Industry, Development of, 372

Lenses, How made, 354
Locomotive Wheel Drop and its Functions, 292
Locomotives:—British "Pacific," 30; French 2-10-0 Compound, 469; "Good-bye to Pollitt 4-4-0s," 718; G.W.R. "Castle" class, 209; L.M.S.R. "Baby Scots," 470, 631, 712; L.M.S.R. Old and New 4-4-0s, 212; L.M.S.R. Three-Cylinder Tanks, 391; L.M.S.R. Two Cylinder 4-6-0s, 877; L.N.E.R. "Cock o' the North," 546, 619, 631, 712; L.N.E.R. "Mikado," 550; L.N.E.R. "Pacific" class, 874; "Mogul" in Great Britain, 128, 210, 213; Renumbering of L.M.S.R., 468; Six-Engined "Sentinel," 872; Some old London Tanks, 626; S.R. "Schools" class, 387, 551, 713, 874; Stroudley "Gladstones" of the L.B.S.C.R., 786; U.S.S.R. "Beyer-Garratt," 291.
L.M.S. Railway—"Dabeg" Feed Water Heaters, 208; Diesel-Electric Rail Cars, 628; Mechanical Carriage Washing, 390; "Night Scot," On footplate of, 132; "Royal Scot," Return of, 35; Six-Wheeled Passenger Brake Vans, 34; "The Princess Royal," Footplate Trip on, 548; Third Class Sleeping Cars, 295
L.N.E. Railway:—"Queen of Scots," Record Run, 35; Locomotive Experiments and Speeding-up, 975; "Night Scotsman," Trip on the, 972
Lubricating Oils and Graphite Grease, 356
Lubricator, Mechanical, Ingenious, 189

Machine Tool Attachments, Matterson, 487, 768
Maya City, Wonderful Relics of a, 378
Meccano Aeroplane Splint, 901
Meccano Aeroplanes, Outdoor Fun with, 567
Meccano aids Chemical Research, 728
Meccano aids St. Paul's Cathedral Engineers, 618
Meccano, Blue-Gold, 1004
Meccano, British Marine Engine History in, 228, 314, 404, 483, 564, 644
Meccano, British Navy in, 722
Meccano, Bush Differential Analyser in, 441, 442
Meccano Club Notes, 63, 157, 239, 325, 415, 495, 575, 653, 733, 817, 905, 1019
Meccano Competition Models:—Accordian Player, 811; Aeroplanes, 319; Bandit, 153; Blacksmiths, 151; Boxing Match, 811; Cathedral, 407; Cenotaph, 407; "Editor at his Desk," 59; Electric Cooker, 1007; Excavator, 1001; Floating Dock, 809; Gas Cooker, 411; Guardsman, 153; Guillotine Machine, 647; Jointed Dog, 811; Knight on Horse, 153; Locomotives, 237, 725; Loom, 651; Mediæval Tournament, 810; Motor Cars, 729, 899; Motor Cycles, 237, 488; Omnibus, 57; Pit-Head Gear, 321; Printing Machine, 899; Racing Car, 57; "Road-Breaker," 59; Robot, 647; Rocking Bird, 810; Scammell Lorry, 571; Ships, 57, 491, 725, 895, 899, 1015; Speedboat, 57; Traction Engine, 571; Wool-Scouring Plant, 491
Meccano Dinky Toys, Collecting, 996
Meccano Guild, Secretary's Notes, 62, 155, 238, 323, 413, 493, 573, 652, 731, 815, 903, 1017
Meccano in a German Prison Camp, 302
Meccano Lathe, Wax Modelling on, 808
Meccano Lighting Set, 1013
Meccano Model-Building Contest Results, 59, 153, 237, 321, 407, 491, 571, 647, 725, 810-11, 899, 1007
Meccano Models, New:—Aeroplanes, 570, 813; Aircraft Carrier, 813; Autogiro, 649; Beam Engine, 234; Delivery Tricycle, 1026; Dornier DoX, 234; Fairground Attractions, 144; Fly-Boats, 812; Goal-Keeper, 812; Hack-Saw, 649; Horse and Trap, 1005; Lift Bridges, 648, 813; Locomotive Coaling Plant, 553; Motor Cycles, 488; Motor Truck, 235; Outboard Motor, 52; "Penny-in-the-Slot" Weighing Machine, 890; Pontoon Crane, 649; Printing Machine, 1003; Radial Drilling Machine, 812; Set of Chessmen, 55; Sewing Machine, 1005; Steam Roller, 648; Stiff-Leg Derrick, 489; Tandem Pumping Engine, 806; Tractor with Trailer, 235; Trench Digger, 146; Tipping Motor Lorry, 1005; Ocean Liner, 1015
Meccano Models with Motor Car Parts, 306
Metal Mixers, Giant Molten, 854
Model-Builders, With the, 55, 149, 570, 893
Model Electric Motor, Clever Home-Made, 999
Model Fast Freight Trains, 247
Model Locomotives:—"Caerphilly Castle," 392, 476; "Locomotion," 876
Model Railways, Interesting, 71, 160, 304, 331, 420, 503, 576, 580, 739, 741, 822

Natural History, Birds:—Canadian Sanctuary, 14; Fascination of Watching, 362; Smallest in the World 617; Wonders of Migration; 19, 370
Nickel, Story of, 456

Of General Interest, 772, 954
Oil Separators for Ships, 706
Oppau Nitrogen Factory, 272
Our Busy Inventors, 8, 114, 270, 454, 694, 858

Peru, Mysterious Sky City of, 452
Planets and their Atmospheres, 770, 862
Ports of the World, Great:—Belfast, 536; Cardiff, Swansea and Newport, 366; Dublin, 698; Manchester, 100, Montreal, 956
Pump, Centrifugal, How Made, 445

Railway Coats-of-Arms, British, 632
Railway Fogman and his Work, 206
Railway News, 34, 130, 208, 290, 386, 468, 550, 630, 712, 784, 874, 974
Railway Photographs, Collecting, 16
Railway, Planning a New, 878
Railway Speed Restrictions, 32
Railways:—Facts about British, 714; Firing the "Night Scot," 132; Flying and Burrowing Junctions, 981; Footplate Trip on "The Princess Royal," 548; Leicester and Swannington, 978; Mechanical Carriage Washing Plant, L.M.S.R., 390; Metropolitan Signalling System, 388; Railway Travel in Russia, 294; Switzerland, 802, 870, 976; Track Circuits on South African, 472; Working of Steep Inclines, 710
Railway Ticket, Development of the, 993
Rainfall and how it is Measured, 544
Road and Track, 196, 360, 528, 688, 852
Road Traffic Control, Automatic, 380
Roller, World's Largest Steam, 359
Royal Mint, Machinery of the, 948

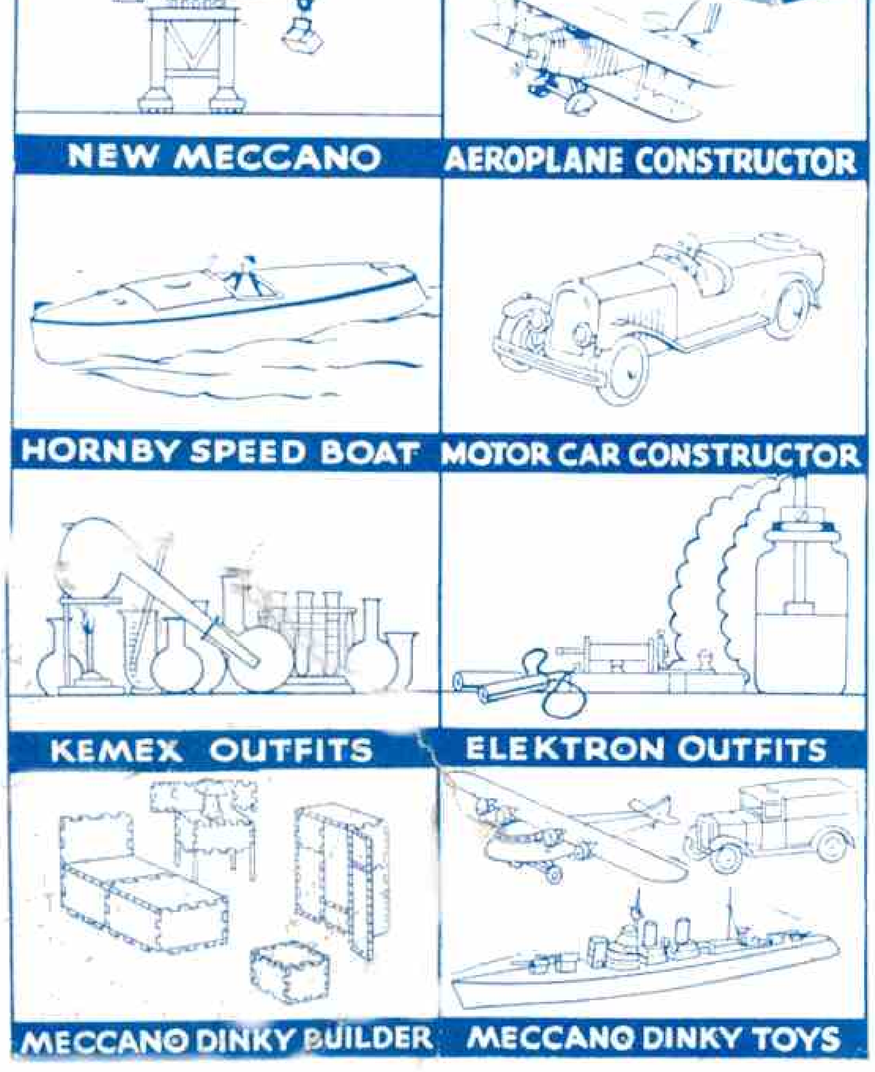
Sacks, Cleaning a Million a year, 552
Salt, Romance of, 966
Sandstone Boulder, Life Story of, 466
Separators, Electrical, 952
Ships:—How Measured, 881; "Twickenham Ferry," S.R., 394; "Victory," H.M.S. 266
Snake Farm, Interesting Brazilian, 700
South African Railways, "Safety First," on, 472
Southern Railway:—Continuous Casting Plant, 384; Electrification Progress, 386, 550; Train Ferry "Twickenham Ferry," 394
Stamp Articles:—Errors and Varieties, 337, 427; Germany's Tribute to Wagner, 171; Gossip, 77, 173, 255, 339, 429, 509, 587, 669, 747, 829, 831, 919, 1031; How Stamps are Printed, 253; Making a good start, 1029; The Old Lady with the Stamps, 75; What is Stamp Collecting? 917
Stephenson, George, Cottages where lived, 769
Suggestions Section:—Automatic Clutch, 231; Automatic Reversing Gear, 726; Balanced Aileron Control, 51; Balloon Tyre, 1011; Caterpillar Track, 51; Four Speed and Reverse Planetary Gear-Box, 50; Internal Expanding Brake, 231; Level Luffing Gear, 1011; Microphone, 51; Miscellaneous, 231, 409, 727, 1011; Pistol, 408; Pre-Selector Self-Changing Gear-Box, 230; Reverse for No. 1 Clockwork Motor, 409; Self-Tipping Skip, 231; Simple Cam Movement, 1011; Spark Arrester for Clock Contacts, 727; Speed Indicator, 727; Spur Differential, 409; Swashplate Movement, 727; Three-Movement Gear-Box, 409; Variable Pitch Propeller, 1010

Telescope built by G.W.R. Mechanic, 638
Telford, Thomas, Life of, 690
Tomb as old as the Pyramids, Irish, 984
Toolmaking in the Stone Age, 856
Tramcar, Remarkable Model, 801
Travel and Adventure, Land:—A Minute I shall never Forget, 989; Climbing Mount Kanchenjunga, 103; Guardians of the Kalahari Desert, 624; Gathering the Maize Harvest, 556; Pets of an African Camp, 286; Southward Ho, with Huberta, 636; In the Zambesi Elephant Country, 216. Sea:—1,000 Miles up the Amazon, 774; Whaling in the Indian Ocean, 532
Tree Rings reveal story of Hopi Indians, 19
Trees reveal secrets of Prehistoric Forest, 288
Tunnels:—Apennine, 469; Mersey, 277, 686; Mont Blanc, proposed, 608; Vosges Mountains 5½-mile, 11; Wawona, U.S.A., 277

War Cemetery at Jerusalem, 280
Welder for Railway Maintenance, 358
Welding, Electric Arc, 12, 108, 550
Windjammer Days, 602
Wireless Aerial, Budapest's Giant, 526
Workers of Jerusalem, 365
World, Our Wonderful, 18, 370, 616

X-Rays and Life, 614
X-Rays in Industry, 538

Yarrow, Sir Alfred F., 22



BEAUTIFULLY PRINTED IN COLOURS

Brimful of Good Things

The new Meccano Book has had a most extraordinary reception, and boys everywhere are loud in their praise of this beautifully printed catalogue. It is indeed a triumph of the printer's art and craftsmanship, consisting of 24 pages, mostly printed in full colour on best quality white art paper. The complete range of Meccano Constructor Outfits, Meccano Kemex and Elektron Outfits, Meccano Dinky Toys and the new Meccano Dinky Builder is illustrated and described in this handsome book.

We hope that every boy in the country, and especially every reader of the Meccano Magazine," will make a point of securing a copy.

HOW TO OBTAIN THE BOOK

The Meccano Book may be obtained from any Meccano dealer, price 2d. If this is not convenient, however, you can send in a remittance of 3½d. to Meccano Limited (Dept. No. 70), Binns Road, Liverpool 13, and we will arrange for a copy of the book to be forwarded immediately, post free.

GET YOUR COPY TO-DAY

Published by

Meccano Ltd. (Dept. No. 70), Binns Rd., Liverpool 13

MECCANO

MOTOR CAR

CONSTRUCTOR

Meccauto 538,189

Build your own Motor Cars!

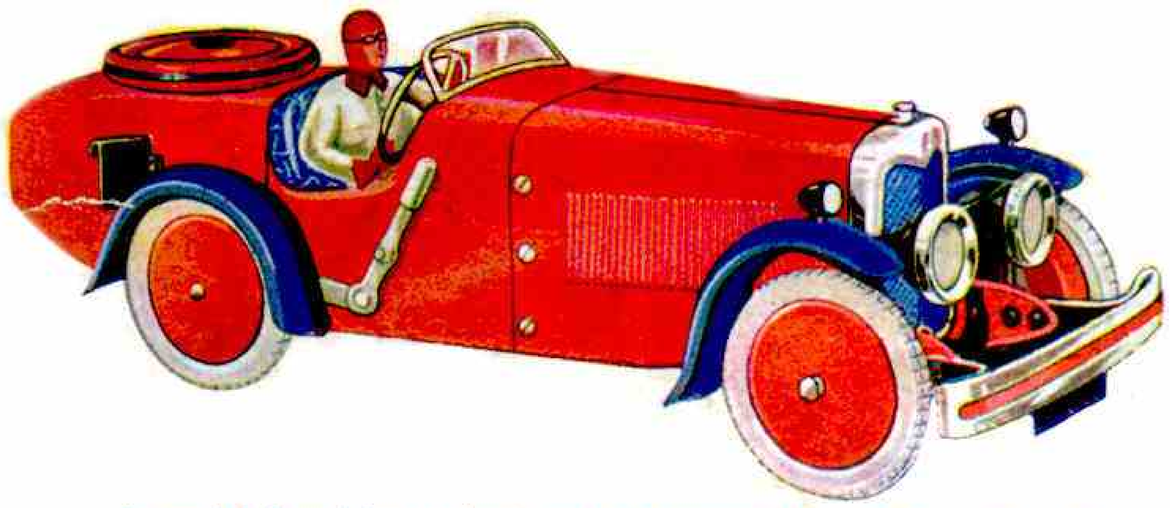
Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to build. Your days will be full of fun and thrills!

Perfect miniature reproductions of many different types of car can be built with these splendid Outfits, and a powerful clockwork motor, that gives the models a long run on one winding, is included in each Outfit.

Choice Range of Colours

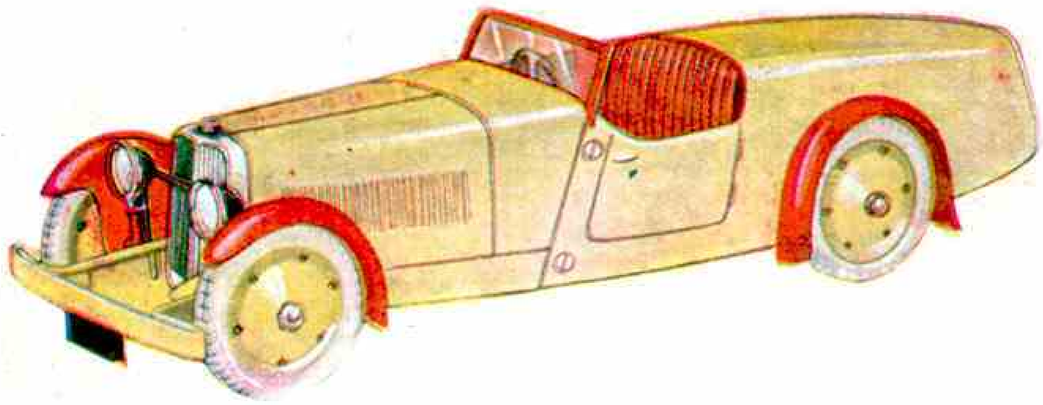
If extra parts in any of the standard colours are required they can be purchased from any Meccano dealer. In addition to the four standard colour combinations, the following parts are available in the colours indicated :—

Body Sections : orange, yellow. Wheels : orange, yellow. Wings : orange, green.

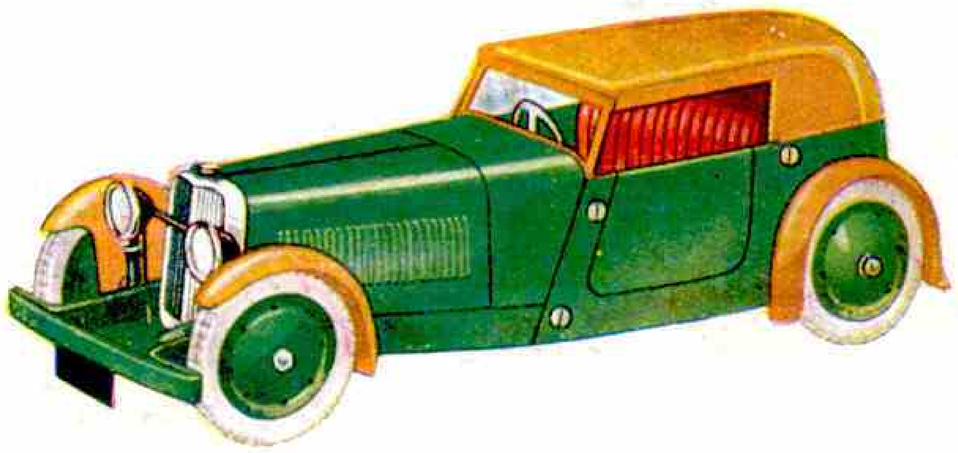


A model Road Racer built with Meccano No. 2 Motor Car Constructor Outfit. Note the hand brake operating on the rear wheel.

This realistic No. 2 Outfit Sports Tourer has a longer wheelbase than the model shown above, and another feature is the different type of wings.



An attractive model of a Road Racing Car built with the Meccano No. 1 Motor Car Constructor Outfit. It is a two-seater model with a streamlined tail.



This fine model represents a Four-Seater Sports Tourer, with the hood raised.

IMPORTANT. No. 1 Motor Car Outfit parts cannot be used in conjunction with those of the No. 2 Outfit.

PRODUCT of MECCANO LIMITED LIVERPOOL

No. 1 Motor Car Constructor Outfit

The motor car models that can be built with this Outfit are the finest you ever saw. Look at the examples shown above and think of the fun you could have building these and other types equally graceful and realistic.

No. 1 Outfit is available in four different colour combinations—Red and Light Blue, Light Blue and Cream, Green and Yellow, and Cream and Red. It is supplied complete with powerful Clockwork Motor. Price **13/6**

No. 2 Motor Car Constructor Outfit

Larger models of a superior type can be built with No. 2 Outfit. They are perfectly designed, beautifully finished and the most attractive examples of constructional engineering ever produced for the delight of boys. Their handsome and realistic appearance may be judged from the accompanying illustrations.

No. 2 Outfit is available in four different colour combinations—Red and Light Blue, Light Blue and Cream, Green and Yellow, and Cream and Red. A powerful Clockwork Motor that gives a run of 150 feet on one winding is included. Price **25/-**

Motor Car Lighting Set

This Lighting Set enables the headlamps of Motor Car models built with the 1933 No. 2 Motor Car Outfit to be electrically lighted. Price **2/6**

Motor Car Garage

The Meccano Motor Car Garage provides accommodation for any Meccano model motor car or other car of suitable size. Price **5/6**

Manufactured by

MECCANO LTD – LIVERPOOL.

PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL 13, ENGLAND.
Printed by John Waddington Ltd., Leeds and London.